

SAMSUNG

SAMSUNG Anycall **SGH-X640**

SERVICE *Manual*

SAMSUNG Anycall



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BASIC.

1. Specification

1. GSM General Specification

	GSM900 Phase 1	EGSM 900 Phase 2	DCS1800 Phase 1	PC1900 Phase 1
Freq. Band[MHz] Uplink/Downlink	890~915 935~960	880~915 925~960	1710~1785 1805~1880	1850~1910 1930~1990
ARFCN range	1~124	0~124 & 975~1023	512~885	512~810
Tx/Rx spacing	45MHz	45MHz	95MHz	80MHz
Mod. Bit rate/ Bit Period	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us
Time Slot Period/Frame Period	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms
Modulation	0.3GMSK	0.3GMSK	0.3GMSK	0.3GMSK
MS Power	33dBm~13dBm	33dBm~5dBm	30dBm~0dBm	30dBm~0dBm
Power Class	5pcl ~ 15pcl	5pcl ~ 19pcl	0pcl ~ 15pcl	0pcl ~ 15pcl
Sensitivity	-102dBm	-102dBm	-100dBm	-100dBm
TDMA Mux	8	8	8	8
Cell Radius	35Km	35Km	2Km	2Km

2. GSM TX power class

TX Power control level	GSM900
5	33 ±2 dBm
6	31 ±2 dBm
7	29 ±2 dBm
8	27 ±2 dBm
9	25 ±2 dBm
10	23 ±2 dBm
11	21 ±2 dBm
12	19 ±2 dBm
13	17 ±2 dBm
14	15 ±2 dBm
15	13 ±2 dBm
16	11 ±3 dBm
17	9 ±3dBm
18	7 ±3 dBm
19	5 ±3 dBm

TX Power control level	DCS1800
0	30 ±3 dBm
1	28 ±3 dBm
2	26 ±3 dBm
3	24 ±3 dBm
4	22 ±3 dBm
5	20 ±3 dBm
6	18 ±3 dBm
7	16 ±3 dBm
8	14 ±3 dBm
9	12 ±4 dBm
10	10 ±4 dBm
11	8 ±4dBm
12	6 ±4 dBm
13	4 ±4 dBm
14	2 ±5 dBm
15	0 ±5 dBm

TX Power control level	PCS1900
0	30 ±3 dBm
1	28 ±3 dBm
2	26 ±3 dBm
3	24 ±3 dBm
4	22 ±3 dBm
5	20 ±3 dBm
6	18 ±3 dBm
7	16 ±3 dBm
8	14 ±3 dBm
9	12 ±4 dBm
10	10 ±4 dBm
11	8 ±4dBm
12	6 ±4 dBm
13	4 ±4 dBm
14	2 ±5 dBm
15	0 ±5 dBm

2. Circuit Description

1. SGH-X640 RF Circuit Description

1) RX PART

1. ASM(U103) Switching Tx, Rx path for GSM900, DCS1800, PCS1900 by logic controlling.

2. ASM Control Logic (U103) Truth Table

	VC1	VC2	VC3
GSM Tx Mode	H	L	L
DCS Tx Mode	L	H	L
PCS Tx Mode	H	L	L
GSM Rx Mode	L	L	L
DCS Rx Mode	L	L	L
PCS Rx Mode	L	L	H

3. FILTER

To convert Electromagnetic Field Wave to Acoustic Wave and then pass the specific frequency band.

- GSM FILTER (F100) For filtering the frequency band between 925 and 960 MHz
- DCS FILTER (F102) For filtering the frequency band between 1805 and 1880 MHz.
- PCS FILTER (F101) For filtering the frequency band between 1930 and 1990 MHz.

4. VC-TCXO (OSC100)

This module generates the 26MHz reference clock to drive the logic and RF. After division by two a reference clock of 13MHz is supplied to the other parts of the system through the pin CLKOUT. After additional process, the reference clock applies to the U100 Rx IQ demodulator and Tx IQ modulator. And then, the oscillator is controlled by serial data to select channel and use fast lock mode for GPRS high class operation.

5. Transceiver (U100)

The receiver front-end which amplifies the GSM, DCS aerial signal, converts the chosen channel down to a low IF signal of 100 kHz. The first stages are symmetrical low noise amplifiers (LNAs). The LNAs are followed by an IQ down mixer. It consists of two mixers in parallel but driven by quadrature out of phase LO signals. The In phase (I) and Quadrature phase (Q) IF signals are low pass filtered to provide protection from high frequency offset interferes. The low IF I and Q signals are then fed into the channel filter. The front-end low IF I and Q outputs enter the integrated bandpass channel filter with provision for five 8 dB gain steps in front of the filter.

2) TX PART

I and Q baseband signals are applied to the IQ modulator that shifts the modulation spectrum up to the transmit IF. It is designed for low harmonic distortion, low carrier leakage and high image rejection to keep the phase error as small as possible.

The modulator is loaded at its IF output by an integrated low pass filter that suppress unwanted spurs prior to get into the phase detector. The clock drive is generated by division of the RFLO signal provided for the transmit offset mixer. Baseband IQ signal fed into offset PLL, this function is included inside of U100 chip. OSC101 chip generates modulator signal which power level is about 6.5dBm and fed into Power Amplifier(U102). The PA output power and power ramping are well controlled by Auto Power Control circuit. We use offset PLL below table.

Modulation Spectrum	200kHz offset 30 kHz bandwidth	GSM	-35dBc
		DCS	-35dBc
	400kHz offset 30 kHz bandwidth	GSM	-66dBc
		DCS	-65dBc
	600kHz ~ 1.8MHz offset 30 kHz bandwidth	GSM	-75dBc
		DCS	-68dBc

2. Baseband Circuit description of SGH-X640

1. PCF50601

1.1. Power Management

Ten low-dropout regulators designed specifically for GSM applications power the terminal and help ensure optimal system performance and long battery life. A programmable boost converter provides support for 1.8V, 3.0V, and 5.0V SIMs, while a self-resetting, electronically fused switch supplies power to external accessories. Ancillary support functions, such as RTC module and High Voltage Charge pump, Clock generator, aid in reducing both board area and system complexity. I2C BUS serial interface provides access to control and configuration registers. This interface gives a microprocessor full control of the PCF50601 and enables system designers to maximize both standby and talk times.

Supervisory functions, including a reset generator, an input voltage monitor, and a temperature sensor, support reliable system design. These functions work together to ensure proper system behavior during start-up or in the event of a fault condition(low microprocessor voltage, insufficient battery energy, or excessive die temperature).

1.2. Backlight Brightness Modulator

The Backlight Brightness Modulator (BBM) contains a programmable Pulse-width modulator (PWM) and FET to modulate the intensity of a series of LED's or to control a DC/DC converter that drives LCD backlight.

But, this phone (SGH-X640) is use UFB LCD. UFB LCD controls backlight brightness by contrast setting.

So "BL_VDD" voltage is always high value when phone is in active mode. When phone is in dimming mode "BL_VDD" goes to about 10% duty PWM.

1.3. Clock Generator

The Clock Generator (CG) generates all clocks for internal and external usage. The 32768 Hz crystal oscillator provides an accurate low clock frequency for the PCF50601 and other circuitry.

2. LCD Connector

LCD is consisted of main LCD(color 65K UFB LCD).

Chip select signals LCD_MAIN_CS can enable LCD. BACKLIGHT signal enables white LED of main LCD.

"RESET_2V8" signal initiates the reset process of the LCD.

16-bit data lines(LD(0)~LD(15)) transfers data and commands to LCD through bypass capacitor. Data and commands use "RS" signal. If this signal is high, inputs to LCD are commands. If it is low, inputs to LCD are data.

The signal which informs the state of LCD is whether input or output, is required. But in this system, there is no input state from LCD. So only "L_WR" signal is used to indicate write data or command to LCD. Power signals for LCD are "VBAT" and "VDD2".

"M_SCL", "M_SCA", "PCLK", "FVALID", "LVALID" and "STANDBY" signals are all related to camera working.

"SVC_LED" is signal for service led when the signal is low led is on and vice versa. "SPK_P" and "SPK_N" are used for audio speaker containing voice or melody. And "VDD_VIB" from PCF50601 enables the motor.

3. Key

This is consisted of key interface pins among OM6359, KBIO(0:7). These signals compose the matrix. Result of matrix informs the key status to key interface in the OM6359. Power on/off key is separated from the matrix. So power on/off signal is connected with PCF50601 to enable PCF50601. Fifteen key LEDs are use the "VBAT" as supply voltage.

"VDD_KEY" signal enables LEDs. "FLIP" informs the status of folder (open or closed) to the OM6359. This uses the hall effect IC, SH248CSP. A magnet under main LCD enables SH248CSP.

4. EMI ESD Filter

This system uses the EMI ESD filter, EMIF09 to protect noise from IF CONNECTOR part.

5. IF connetor

It is 18-pin connector. They are designed to use VBAT, V_EXT_CHARGE, TXD0, RXD0, RTS0, CTS0, JIG_REC, CHARGER_OK, RXD1, TXD1, AUX_MIC, AUX_SPK and GND. They connected to power supply IC, microprocessor and signal processor IC.

6. Battery Charge Management

A complete constant-current/constant-voltage linear charger is used for single cell lithium-ion batteries. If TA connected to phone, "V_EXT_CHARGE" enable charger IC and supply current to battery.

When fault condition caused, "CHG_ON" signal level change low to high and charger IC stop charging process.

7. Audio

EARP_P and EARP_N from OM6359 are connected to the main speaker. AUXSP is connected to the Hands free kit. MIC_P and MIC_N are connected to the main MIC. And AUX_MIC_P and AUX_MIC_N are connected to the Hands free kit.

YMU762C is a LSI for portable telephone that is capable of playing high quality music by utilizing FM synthesizer and ADPCM decoder that are included in this device.

As a synthesis, YMU762C is equipped 32 voices with different tones. Since the device is capable of simultaneously generating up to synchronous with the play of the FM synthesizer, various sampled voices can be used as sound effects. Since the play data of YMU762C are interpreted at anytime through FIFO, the length of the data(playing period) is not limited, so the device can flexibly support application such as incoming call melody music distribution service. The hardware sequencer built in this device allows playing of the complex music without giving excessive load to the CPU of the portable telephones.

Moreover, the registers of the FM synthesizer can be operated directly for real time sound generation, allowing, for example, utilization of various sound effects when using the game software installed in the portable telephone. YMU762C includes a speaker amplifier with high ripple removal rate whose maximum output is 550mW (SPVDD=3.6V). The device is also equipped with conventional function including a vibrator and a circuit for controlling LEDs synchronous with music.

For the headphone, it is provided with a stereophonic output terminal.

For the purpose of enabling YMU762C to demonstrate its full capabilities, Yamaha purpose to use "SMAF:Synthetic music Mobile Application Format" as a data distribution format that is compatible with multimedia. Since the SMAF takes a structure that sets importance on the synchronization between sound and images, various contents can be written into it including incoming call melody with words that can be used for training karaoke, and commercial channel that combines texts, images and sounds, and others. The hardware sequencer of YMU762C directly interprets and plays blocks relevant to synthesis (playing music and reproducing ADPCM with FM synthesizer) that are included in data distributed in SMAF.

8. Memory

Signals in the OM6359 enable two memories. They use only one volt supply voltage, VDD3 in the PCF50601. This system uses Samsung's memory, KBB06A500M-T402. It is consisted of 128M bits flash NOR memory and 128M bits flash NAND memory and 64M bits SCRAM. It has 16 bit data line, HD[0~15] which is connected to OM6359 and MV317S. It has 26 bit address lines, HA[1~26]. CS_NAND and NCSRAM signals are chip select. Writing process, HWR_N is low and it enables writing process to flash memory and SRAM. During reading process, HRD_N is low and it enables reading process to flash memory and SRAM. Each chip select signals in the OM6359 select memory among 2 flash memory and SCRAM. Reading or writing procedure is processed after HWR_N or HRD_N is enabled. Memories use reset, which is VDD3 delay from PCF50601. HA[25] signal enables lower byte of SRAM and HA[26] signal enables higher byte of SRAM.

9. OM6359

OM6359 is consisted of ARM core and DSP core. It has 8x1Kword on-chip program/data RAM, 55 Kwords on-chip program ROM in the DSP. It has 4K*32bits ROM and 2K*32bits RAM in the ARM core. DSP is consisted of KBS, JTAG, EMI and UART. ARM core is consisted of EMI, PIC(Programmable Interrupt Controller), reset/power/clock unit, DMA controller, TIC(Test Interface Controller), peripheral bridge, PPI, SSI(Synchronous Serial Interface), ACC(Asynchronous communications controllers), timer, ADC, RTC(Real-Time Clock) and keyboard interface. KBIO(0:7), address lines of DSP core and HD[0~15]. HA[1~26], address lines of ARM core and HD[0~15], data lines of ARM core are connected to memory, YMU762C. MV317S(Camera DSP Chip) controls the communication between ARM core and DSP core.

CS_NAND, NCSRAM, NCSFLASH in the ARM core are connected to each memory. HWR_N and HRD_N control the process of memory. External IRQ(Interrupt ReQuest) signals from each units, such as, PMU need the compatible process. KBIO[0~7] receive the status from key and RXD0/TXD0 are used for the communication using data link cable(DEBUG_DTR/RTS/TXD/RXD/CTS/DSR).

It has JTAG control pins(TDI/TDO/TCK) for ARM core and DSP core. It receives 13MHz clock in CKI pin from external TCXO. ADC(Analog to Digital Converter) part receives the status of temperature, battery type and battery voltage.

10. TOH2600DGI4KRA(26MHz)

This system uses the 26MHz TCXO, TOH2600DGI4KRA, SEM. AFC control signal from OM6359 controls frequency from 26MHz x-tal. The clock output frequency of UAA3536 is 13MHz. This clock is connected to OM6359, YMU762C.

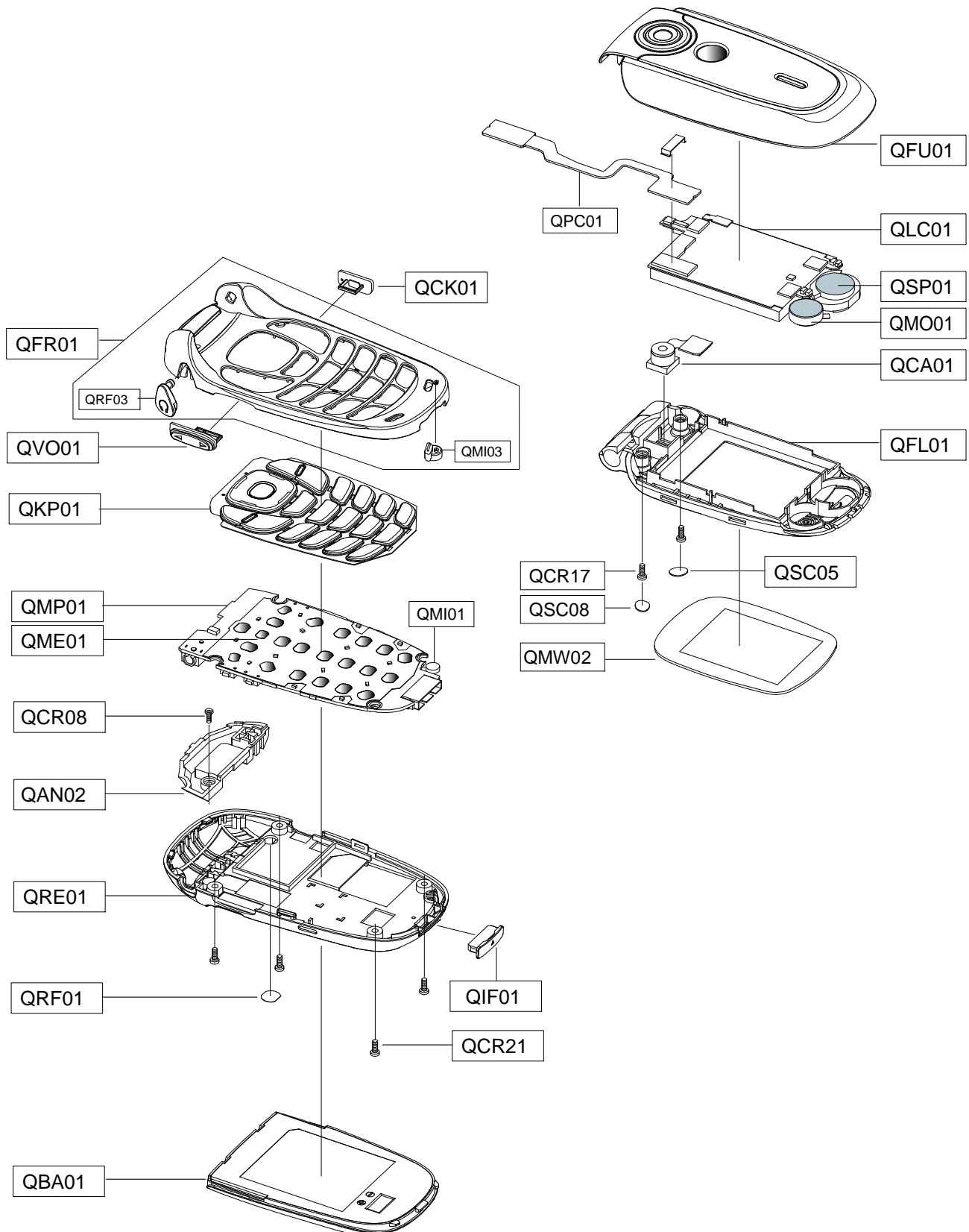
11. Camera DSP(MV317S)

Tiger is an Integrated circuit for mobile phone camera. This structure will allow effectiveness for large data management and significantly reduces main processor will get burden.

In hence, Tiger will allow the user to be able to display to LCD direct without burdening the main processor. It also allows to have various kinds of display size on the LCD and snapshot for Jpeg. Digital effect will also be executed on real time base resulting Tiger as being a video co-processor in the mobile platform. Also, an i80 type processor's 16bit parallel interface of Tiger makes it available for the CPU to interchange the data with Tiger. As the additional 8Mbit is usable except 2Mbit buffer embedded in Tiger, the diverse UI data processing which is not a burden to the CPU is available. JPEG encoder and decoder are baseline ISO/IEC 10918-1 JPEG compliance (DCT-based). JPEG decoder supports YUV444, YUV422, YUV420 and YUV411 format standard JPEG image.

3. Exploded View and Parts list

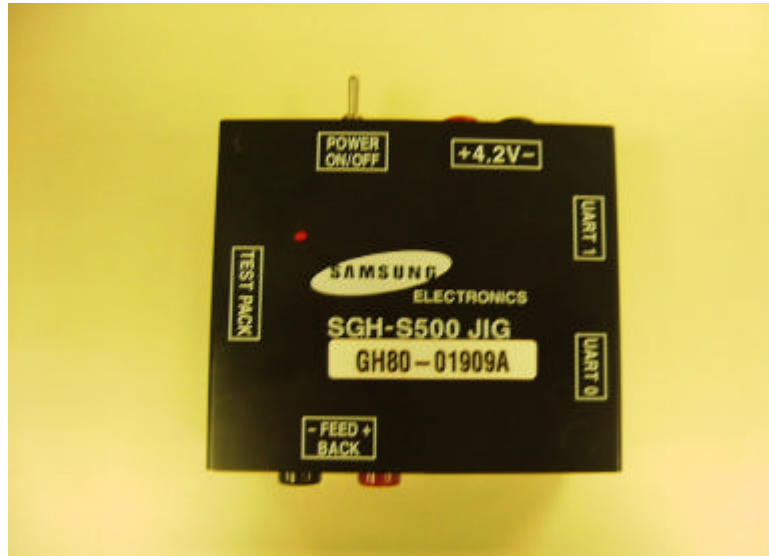
1. Cellular phone Exploded View



2. Cellular phone Parts list

Location NO.		Description	SEC CODE	Remark
QFU01		FOLDER UPPER	GH75-06199A	
QLC01		LCD	GH07-00653A	
QPC01		FPCB	GH41-00774A	
QSP01		SPEAKER	3001-001731	
QMO01		MOTOR DC	3101-001401	
QCA01		UNIT CAMERA	GH59-01472A	
QFL01		FOLDER LOWER	GH75-06200A	
QSC05		SCREW SHEET R	GH74-08872A	
QSC08		SCREW SHEET L	GH74-08873A	
QCR17		SCREW MACHINE	6001-001639	
QMW02		WINDOW MAIN	GH72-19197A	
QFR01		FRONT COVER	GH75-06331A	
	QRF03	EAR COVER	GH72-19199A	
	QMI03	MIC RUBBER	GH73-04064A	
QCK01		CAMERA KEY	GH75-06567A	
QVO01		VOLKEY ASSY	GH75-06566A	
QKP01		KEYPAD	GH75-06201A	
QMP01		MAIN PBA	GH92-02030A	
QME01		UNIT METAL DOME	GH59-01921A	
QMI01		MICROPHONE ASSY	GH30-00130A	
QCR08		SCREW MACHINE	6001-001456	
QAN02		ANTENNA	GH42-00523A	
QRE01		REAR COVER	GH75-06202A	
QRF01		RF SHEET	GH74-13063A	
QIF01		IF COVER	GH72-19208A	
QCR21		SCREW MACHINE	6001-001507	
QBA01		BATTERY	GH43-01658A	

3. Test Jig (GH80-01909A)

3-1. RF Test Cable
(GH39-00283A)3-2. Test Cable
(GH39-00217A)

3-3. Serial Cable



3-4. Power Supply Cable

3-5. DATA CABLE
(GH39-00219A)3-6. TA
(GH44-00482A)

4. Electrical Parts List

Design LOC	SEC CODE
BAT400	4302-001119
C100	2203-005482
C101	2203-005057
C102	2203-005057
C103	2203-005482
C104	2203-000995
C105	2203-005138
C106	2203-000359
C107	2203-000836
C108	2203-005482
C109	2203-000812
C110	2203-001101
C111	2203-000854
C112	2203-000812
C113	2203-005057
C114	2203-005482
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C116	2203-000854
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C118	2203-005496
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C121	2203-000278
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C124	2203-000278
C125	2203-006053
C126	2203-000254
C127	2203-005482
C128	2203-005057
C129	2203-005057
C130	2203-005482
C131	2203-000233
C132	2203-001153
C133	2203-000604
C134	2203-000854
C135	2203-000278

Design LOC	SEC CODE
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C138	2203-000585
C139	2203-000585
C141	2404-001239
C142	2203-000254
C144	2203-000812
C145	2203-000233
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C148	2203-000311
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C151	2203-005053
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C155	2203-000438
C156	2203-000438
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C202	2203-005482
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C204	2203-000679
C205	2203-000995
C206	2203-000254
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C301	2203-000679
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C304	2203-005061
C305	2203-005496
C306	2203-006208

Design LOC	SEC CODE
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C309	2203-002687
C310	2203-005483
C311	2203-006093
C312	2203-006208
C313	2203-005061
C314	2203-000254
C315	2203-005061
C316	2203-001259
C317	2203-000438
C318	2203-001259
C319	2203-006053
C400	2203-005482
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C406	2203-000254
C407	2203-000278
C408	2203-006208
C409	2404-001225
C411	2203-000330
C412	2203-005482
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C414	2203-001652
C415	2203-006053
C416	2203-006324
C417	2203-000888
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C427	2404-001225

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C614	2203-000679
C615	2203-000679
C617	2203-000854
C619	2203-005482
C620	2203-000438
C621	2203-000438
C622	2203-005482
C625	2203-000812
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C627	2404-001352
C628	2203-000278
C702	2203-000254
C703	2203-006257
C704	2203-000278
CN400	3709-001273
CN500	3710-001994

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CN502	3705-001355
D700	0406-001201
D701	0406-001201
EAR600	3722-002249
F100	2904-001469
F101	2904-001480
F102	2904-001470
F103	2901-001254
F700	2901-001286
F701	2901-001286
F702	2901-001286
F703	2901-001286
F704	2901-001286
F705	2901-001286
HDC700	3711-005551
L100	2703-002208
L101	2703-002203
L102	2703-002208
L103	2703-001722
L104	2703-002267
L105	2703-002199
L106	2703-001748
L107	2703-001722
L109	2703-002204
L110	2703-001723
L111	2703-001749
L112	2703-001723
L113	2703-001723
L114	2703-001970
L620	3301-001729
LED700	0601-001602
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LED702	0601-001602
LED703	0601-001602
LED704	0601-001602
LED705	0601-001602

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LED708	0601-001602
LED710	0601-001790
LED711	0601-001790
LED712	0601-001602
LED713	0601-001790
LED714	0601-001602
OSC100	2809-001294
OSC101	2806-001329
OSC300	2801-004285
Q600	0504-001012
Q700	0506-000107
R100	2007-007148
R101	2007-000141
R102	2007-007528
R103	2007-000566
R104	2007-001298
R105	2007-007142
R106	2007-007311
R107	2007-001305
R108	2007-001305
R109	2007-000566
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R111	2007-001305
R112	2007-008117
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R114	2007-001308
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R116	2007-000142
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R119	2007-000142
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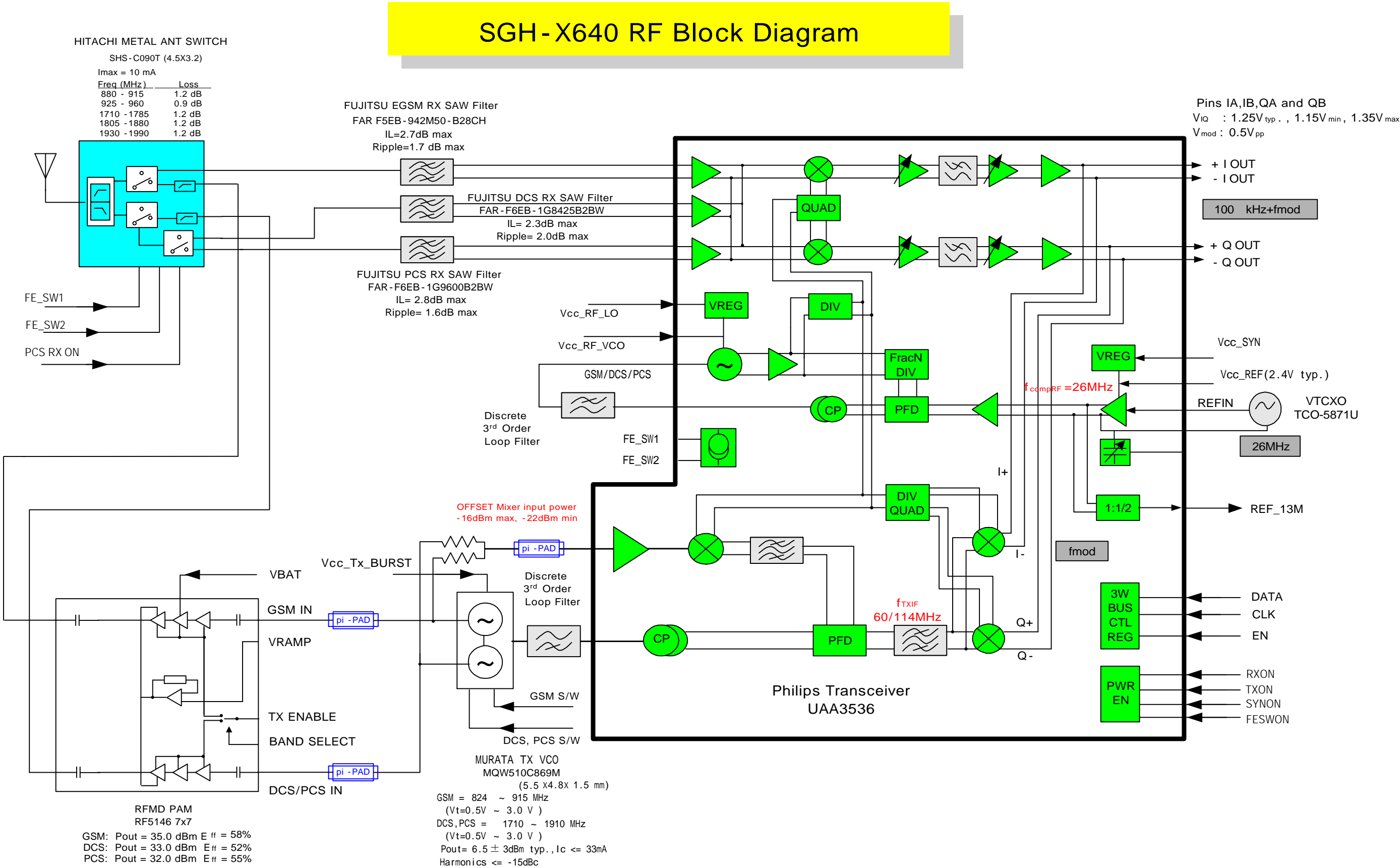
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R512	2007-007588
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R608	2007-007334
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R611	2007-002796
R612	2007-000171
R613	2007-000171
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R615	2007-007489
R700	2007-000143
R701	2007-000143
R703	2007-000174
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R705	2007-000174
R706	2007-000174
R707	2007-000174
R708	2007-000174
R709	2007-000174

Design LOC	SEC CODE
R710	2007-000174
R711	2007-000174
R712	2007-000174
R713	2007-000174
R714	2007-000174
R715	2007-000174
R716	2007-000174
R719	2007-008672
SW300	3404-001152
SW600	1009-001018
SW700	3404-001152
SW701	3404-001152
TH200	1404-001221
U100	1205-002327
U102	1201-002174
U103	2909-001246
U200	1205-002607
U201	0801-002882
U300	0801-002237
U301	1204-002161
U302	1109-001316
U303	GH13-00020A
U304	0801-002882
U306	0801-002882
U400	1205-002350
U500	2901-001246
U502	1203-003486
U603	1001-001253
U610	1202-001036
U701	1203-001917
U702	1203-003459
V600	1405-001082
V601	1405-001082
V602	1405-001082
V603	1405-001082
V604	1405-001082
V605	1405-001082

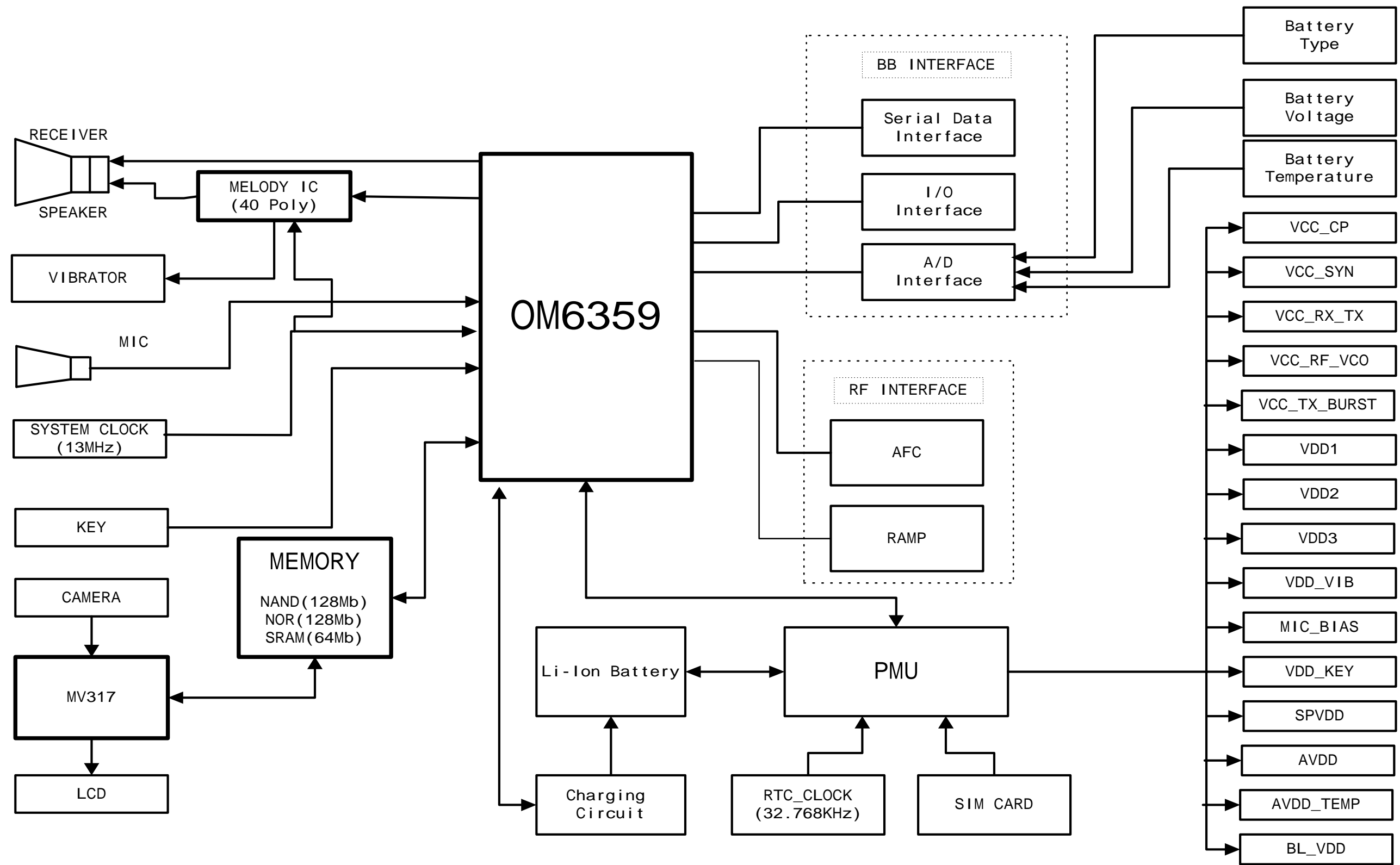
Design LOC	SEC CODE
V700	1405-001128
V702	1405-001128
V704	1405-001128
V705	1405-001128
V706	1405-001128
V707	1405-001128
V708	1405-001128
V709	1405-001128
V710	1405-001128
V711	1405-001128
X400	2801-004339
ZD501	0403-001427
ZD502	0403-001387
ZD600	0406-001194
ZD601	0406-001194
ZD700	0406-001194
ZD701	0406-001194

5. Block Diagrams

1. RF Solution Block Diagram



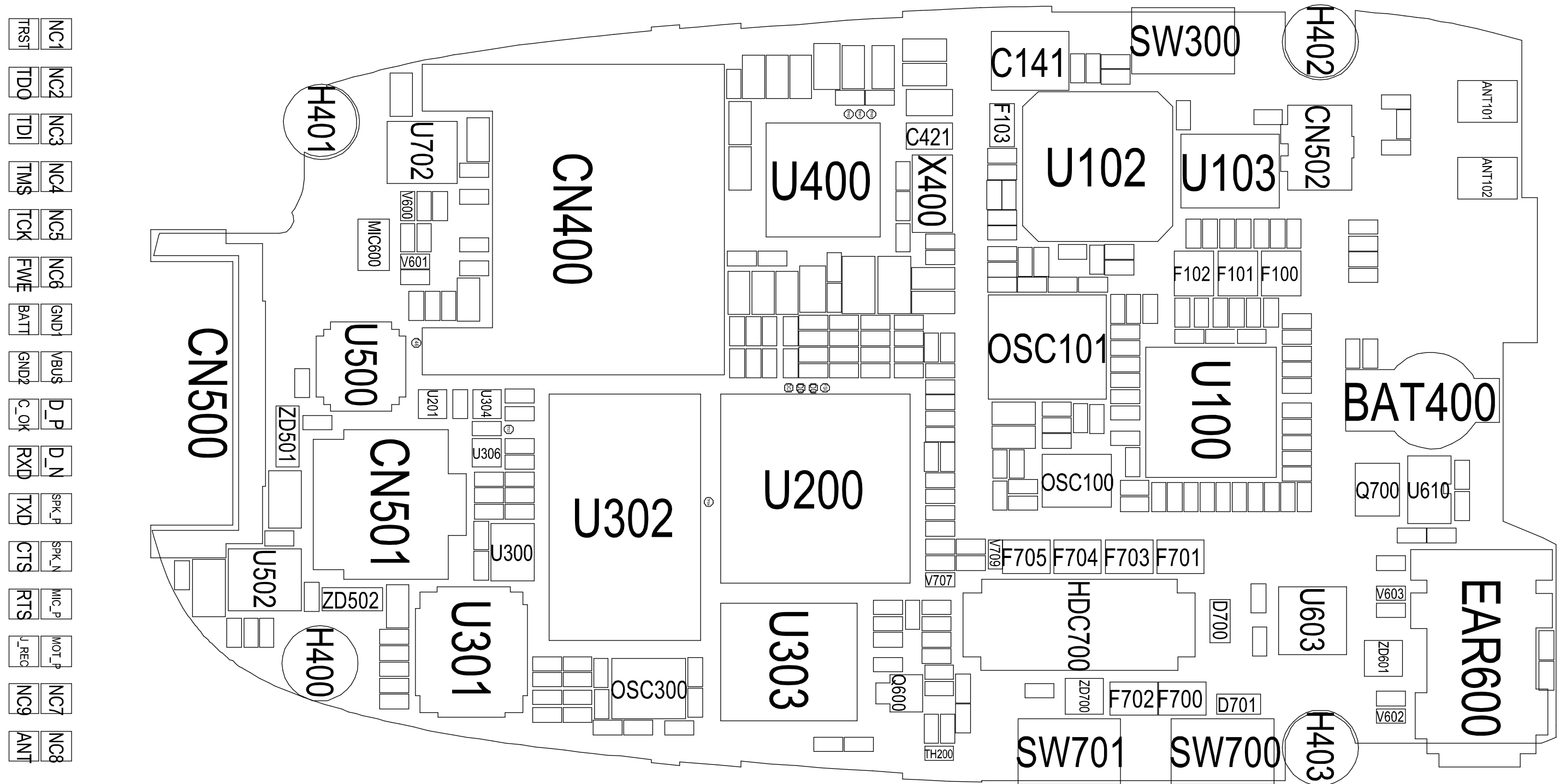
2. Base Band Solution Block Diagram



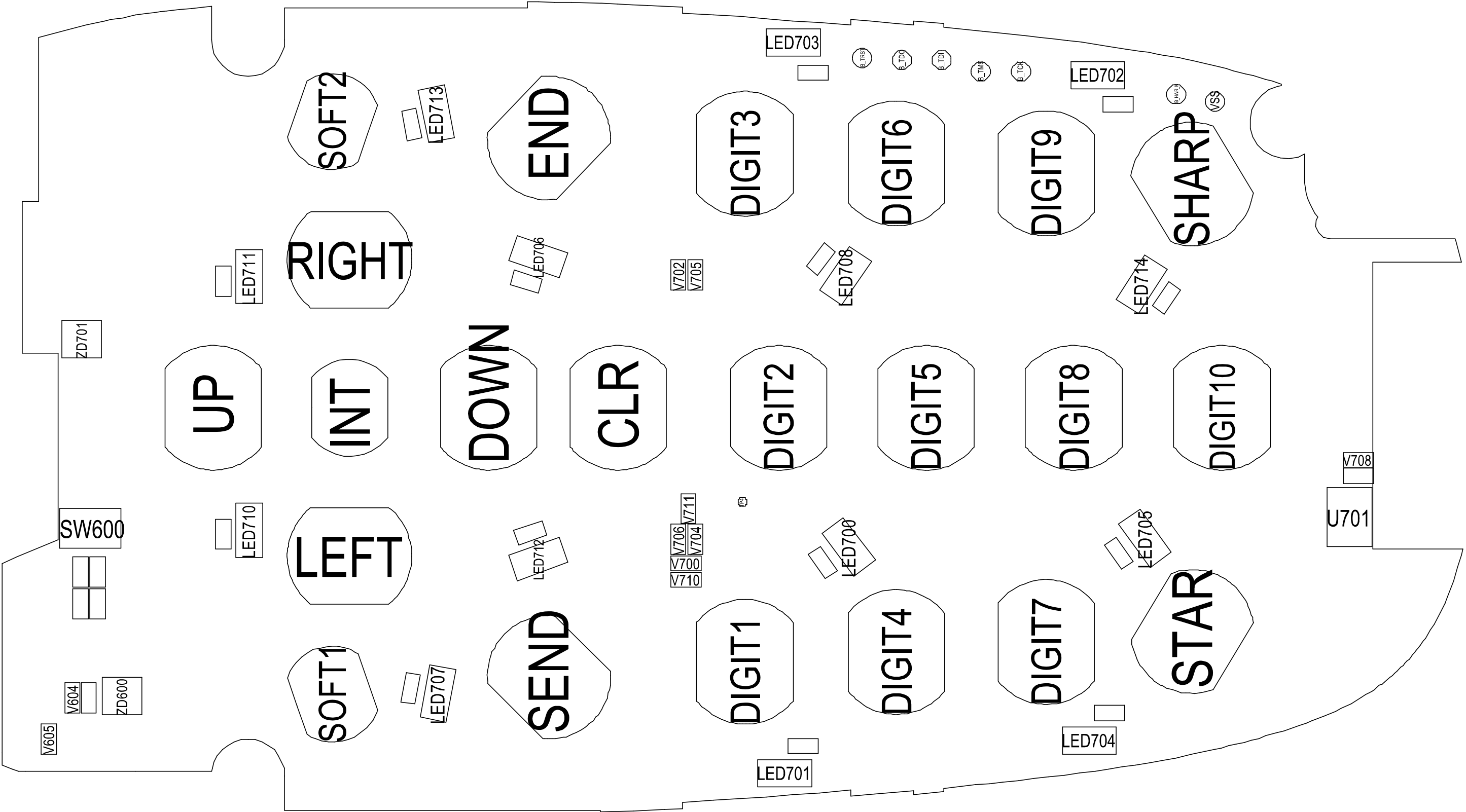
BB Block Diagram of SGH-X640

6. PCB Diagrams

1. Main PCB Top Diagram

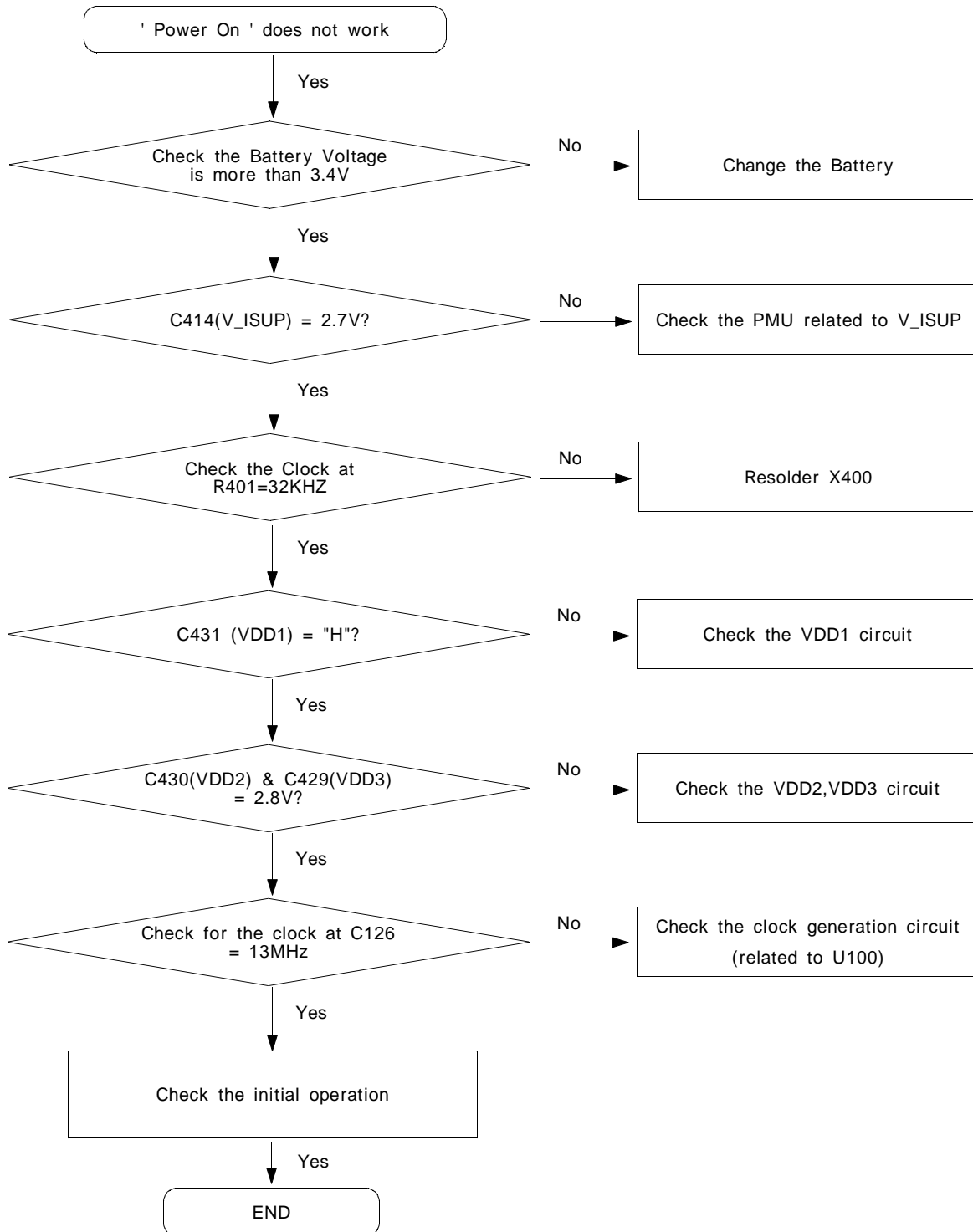


2. Main PCB Bottom Diagram

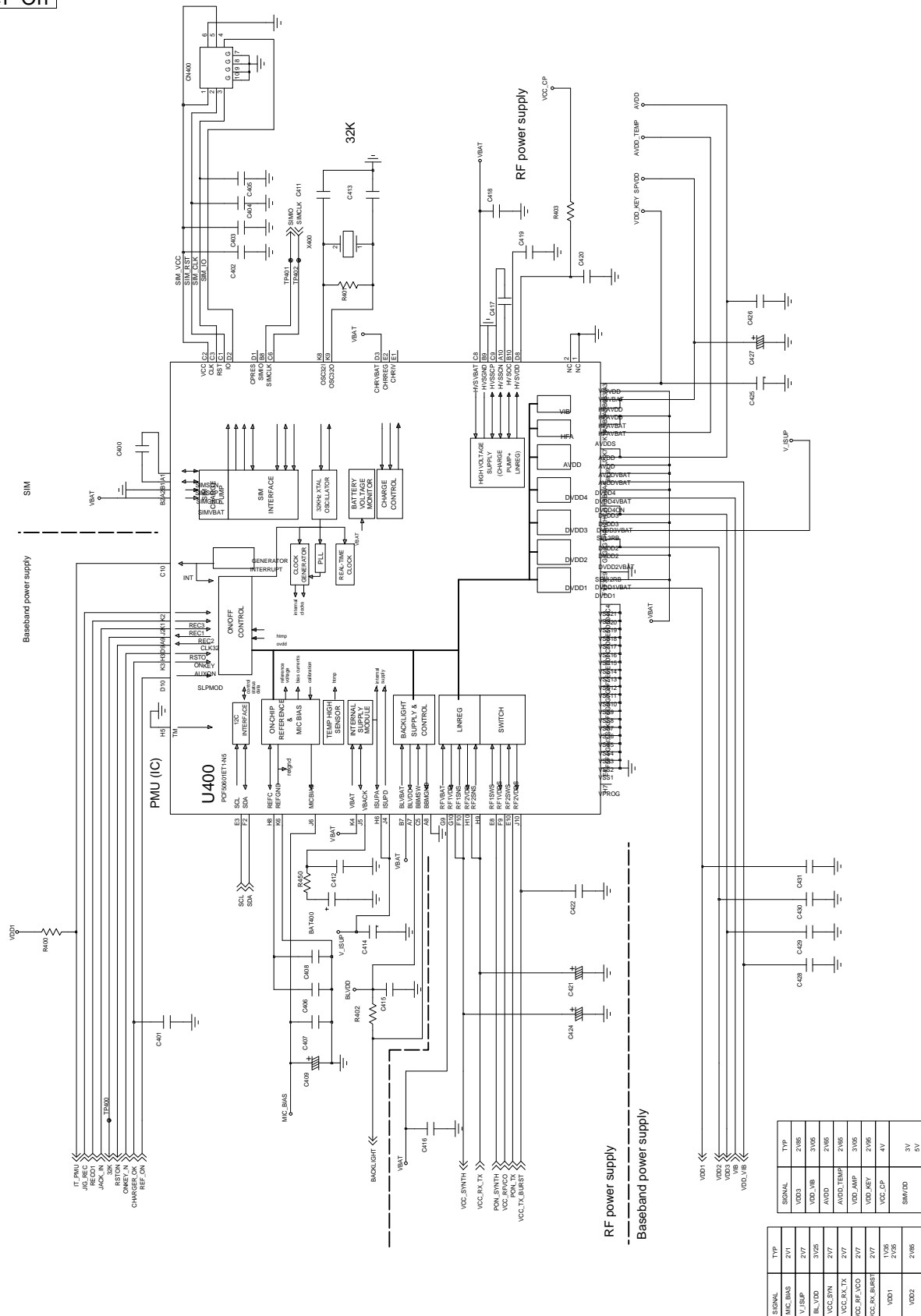


7. Flow Chart of Troubleshooting

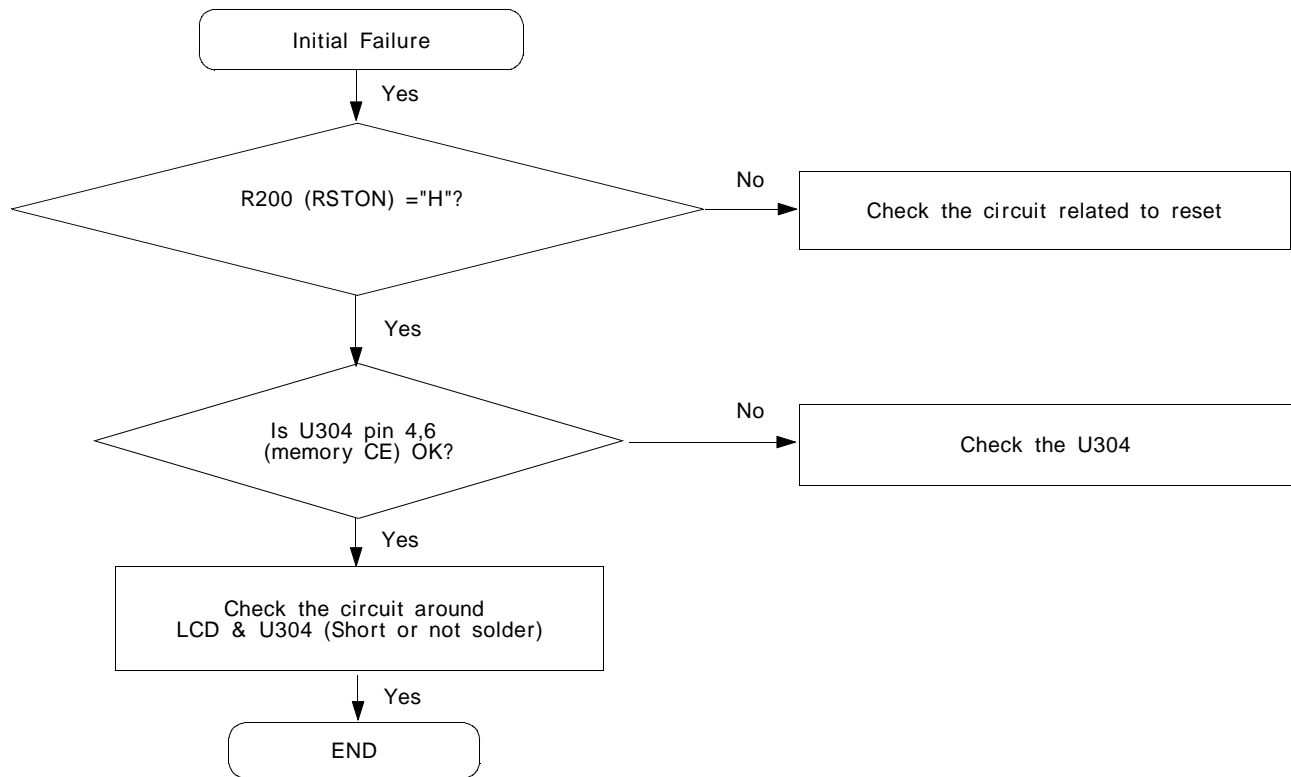
1. Power On



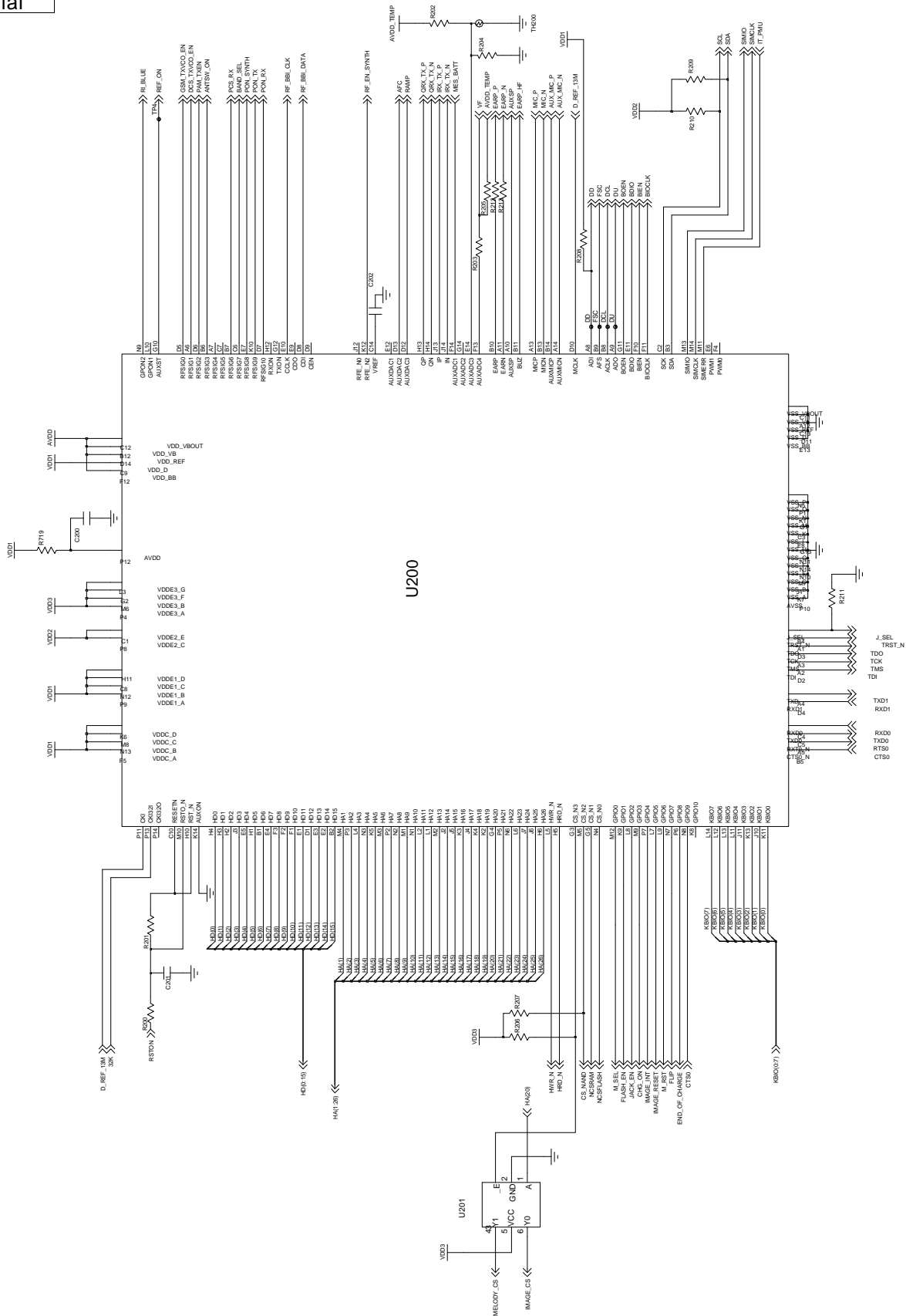
Power On



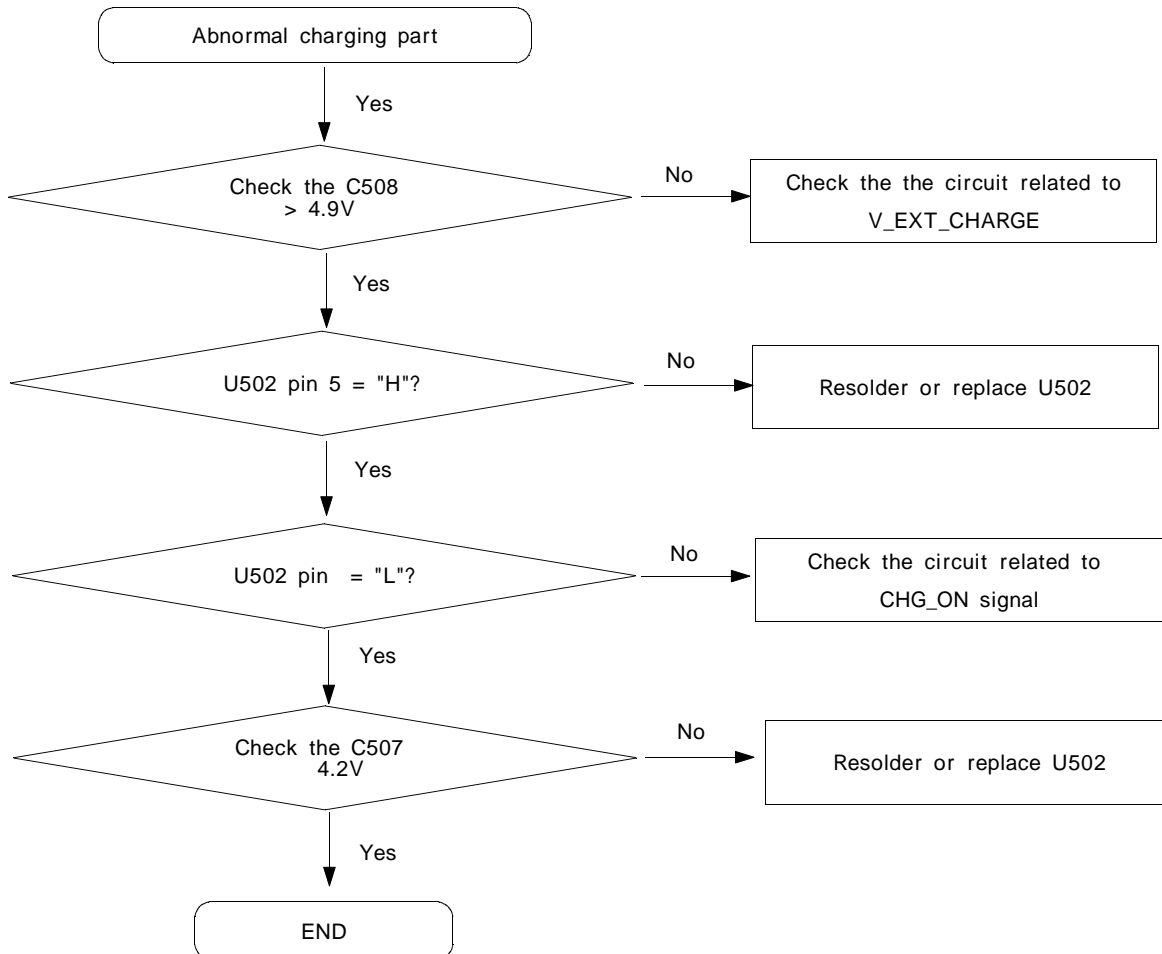
2. Initial



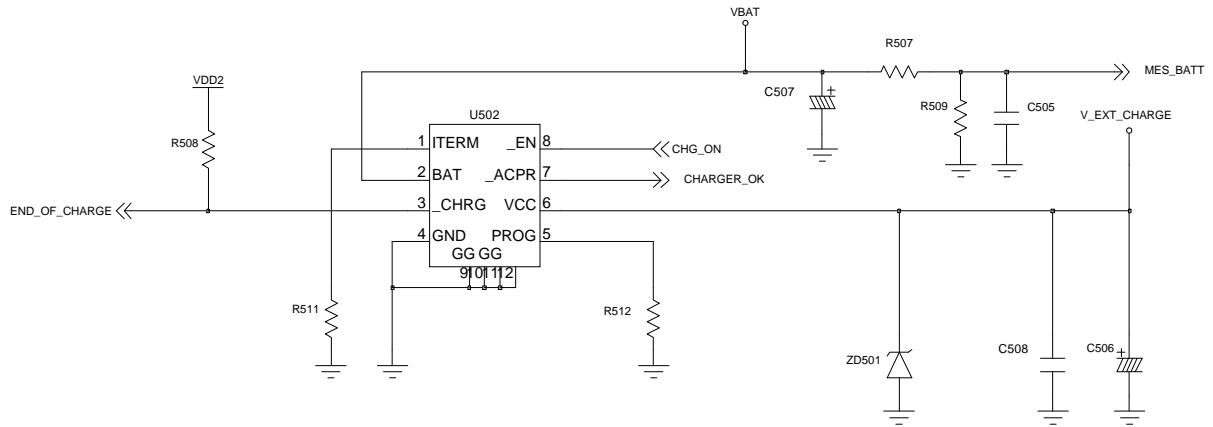
Initial



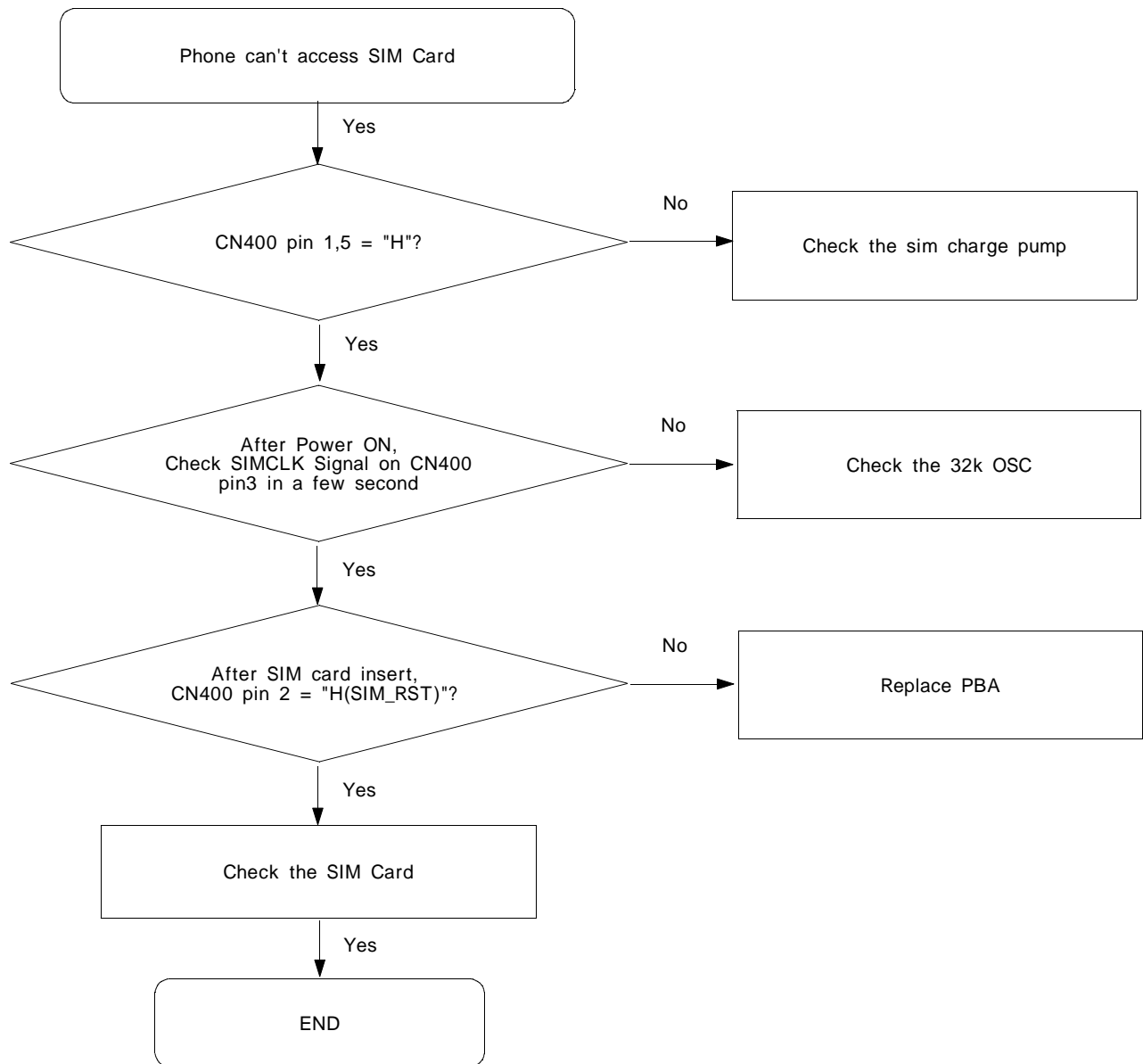
3. Charging Part



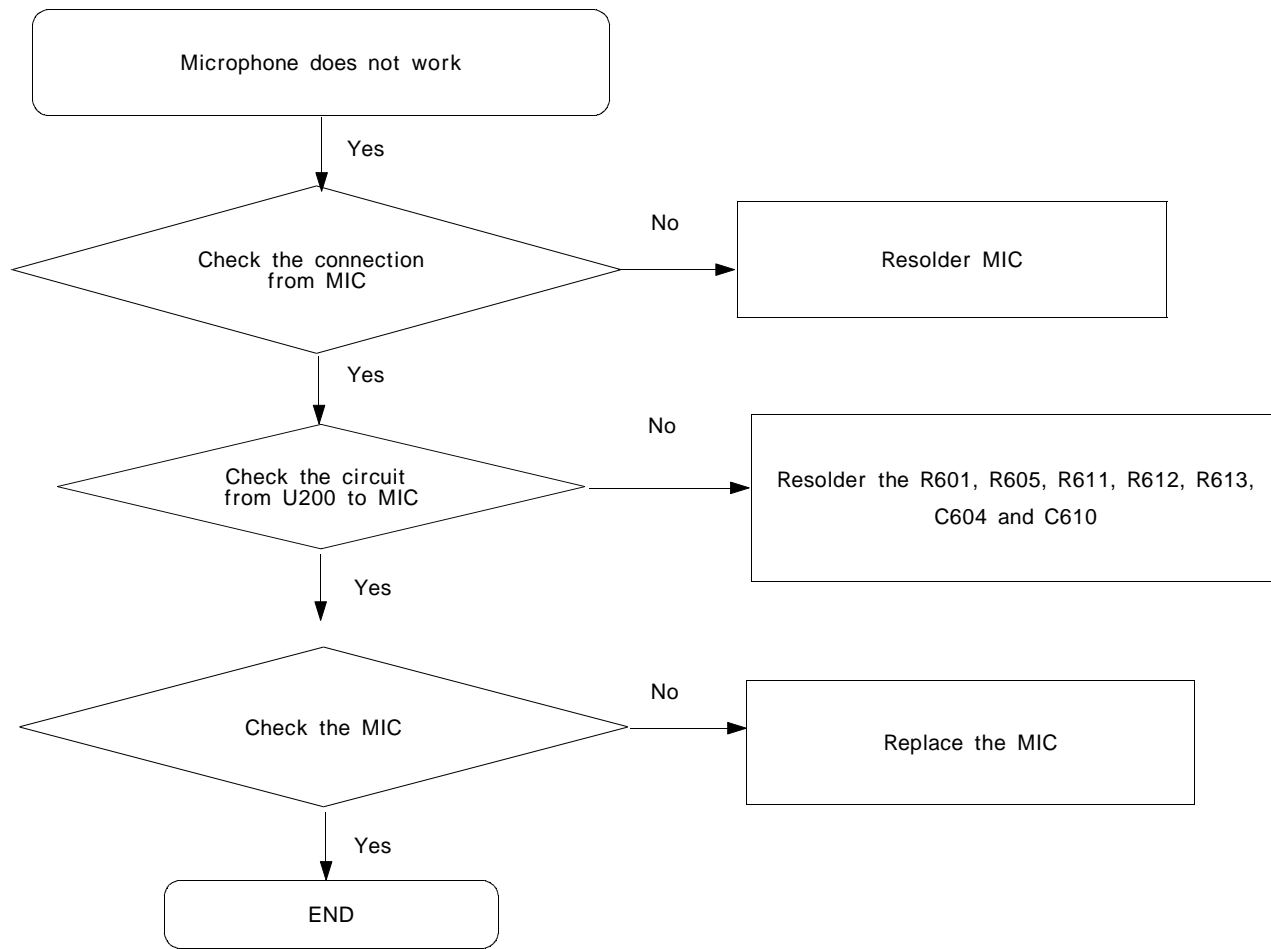
Charging



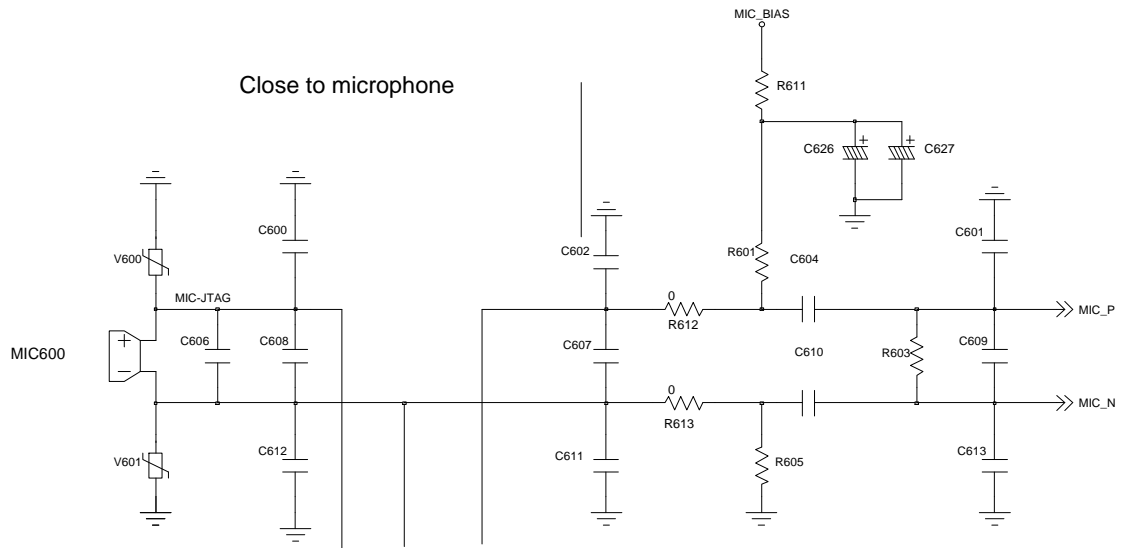
4. Sim Part



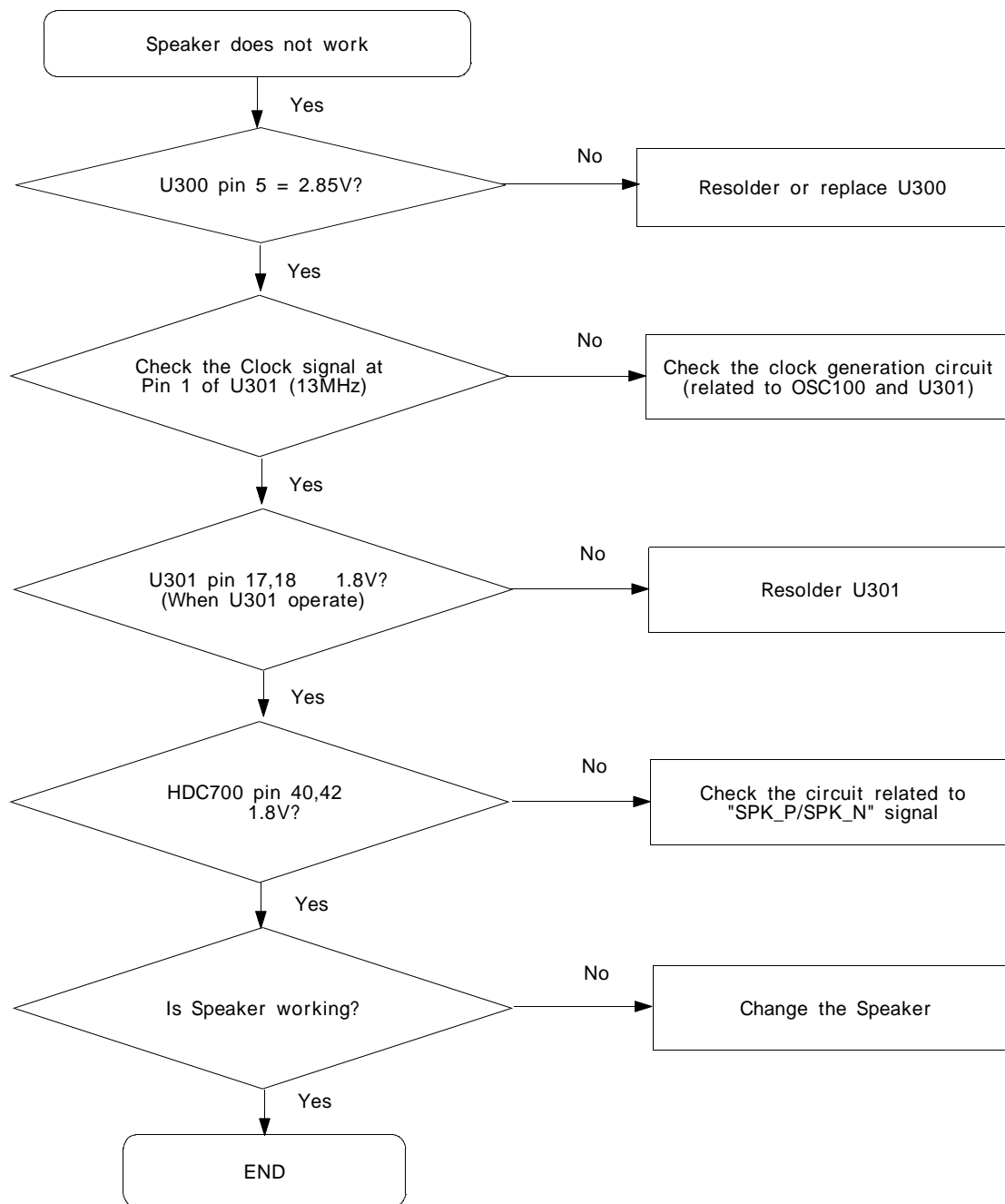
5. Microphone Part



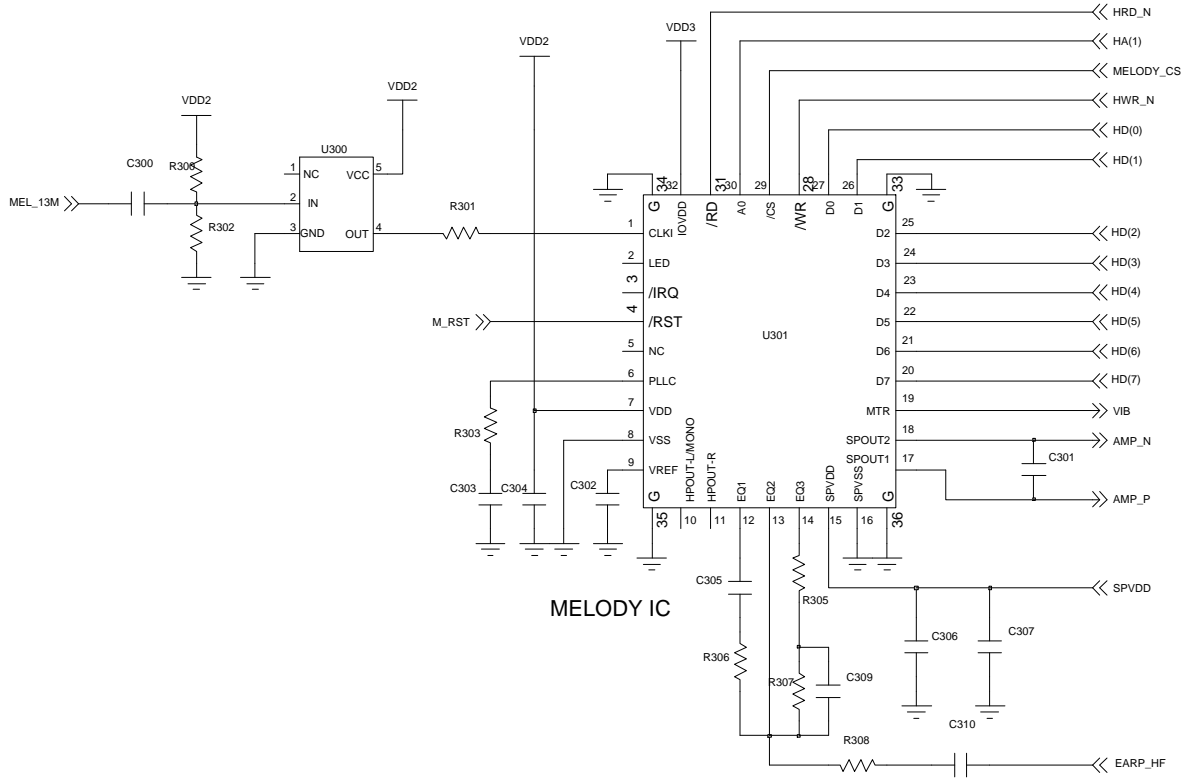
Microphone



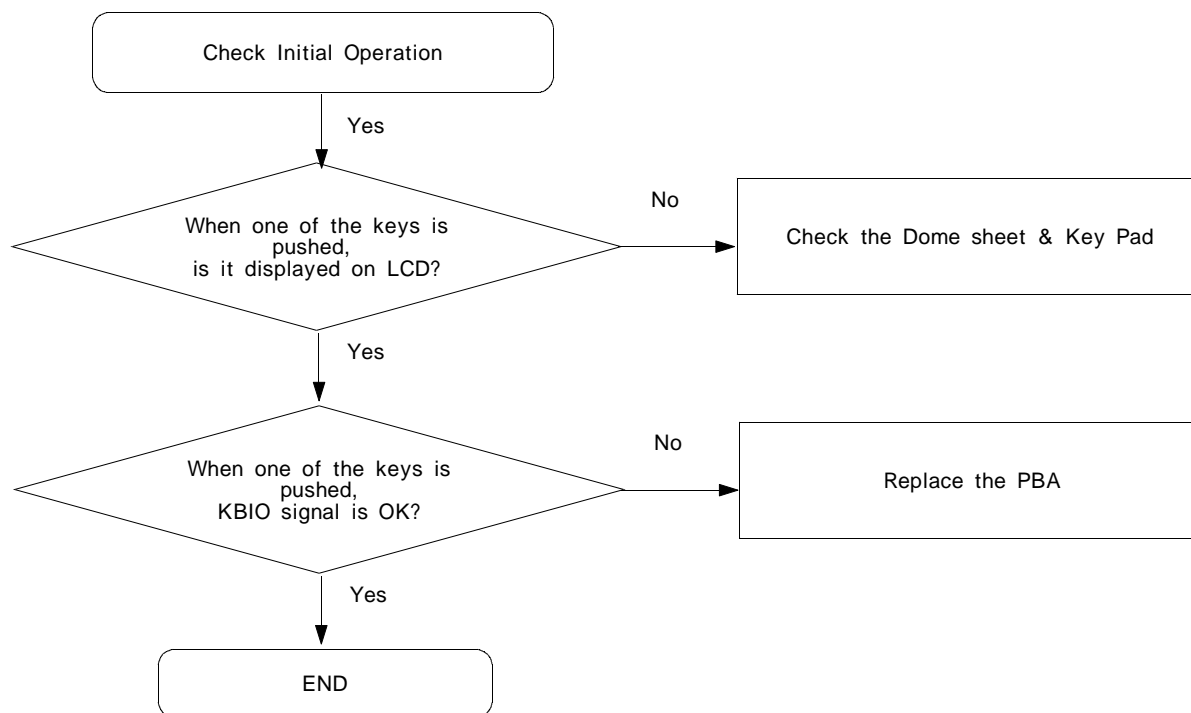
6. Speaker Part(Melody)



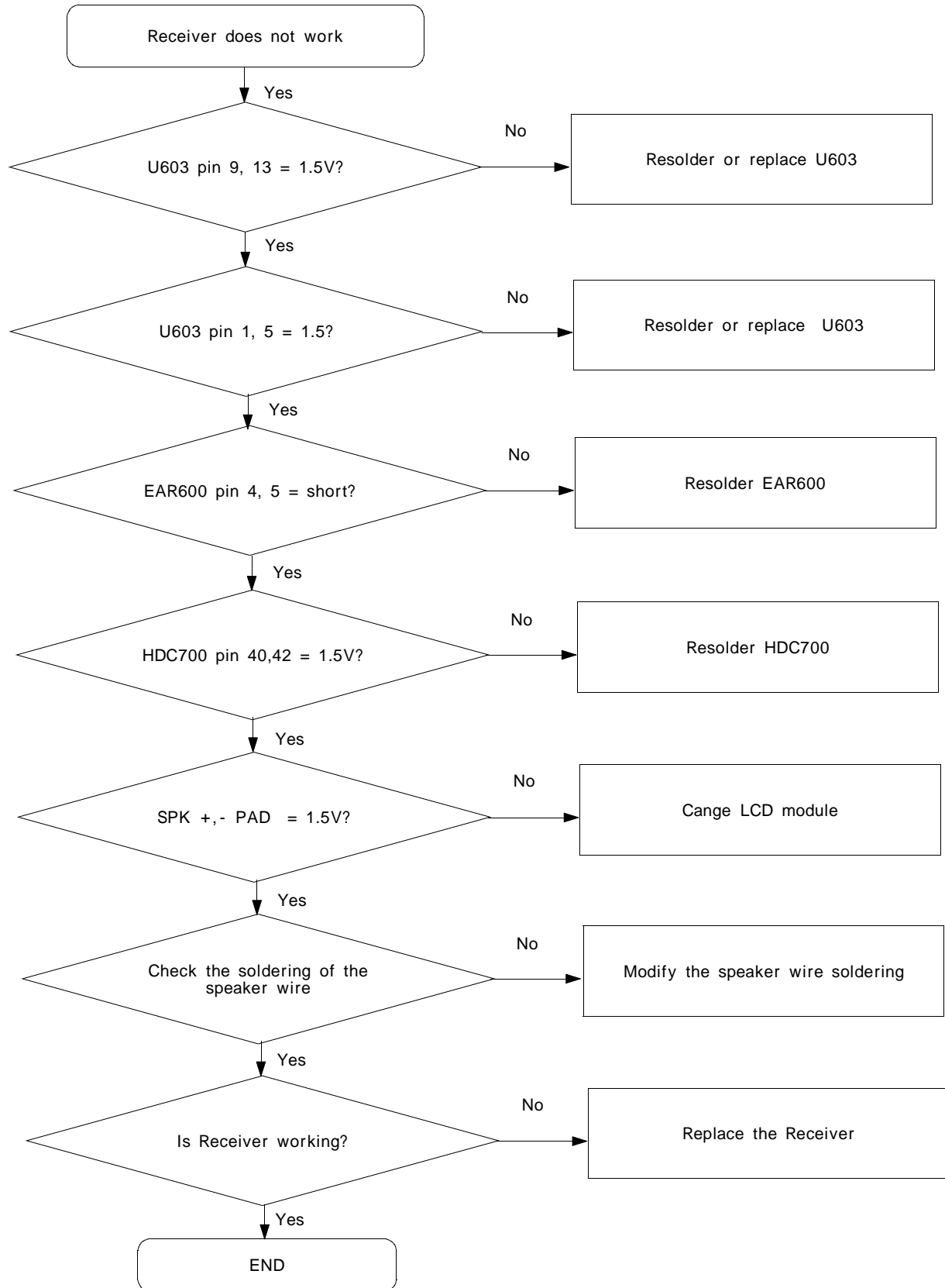
Speaker



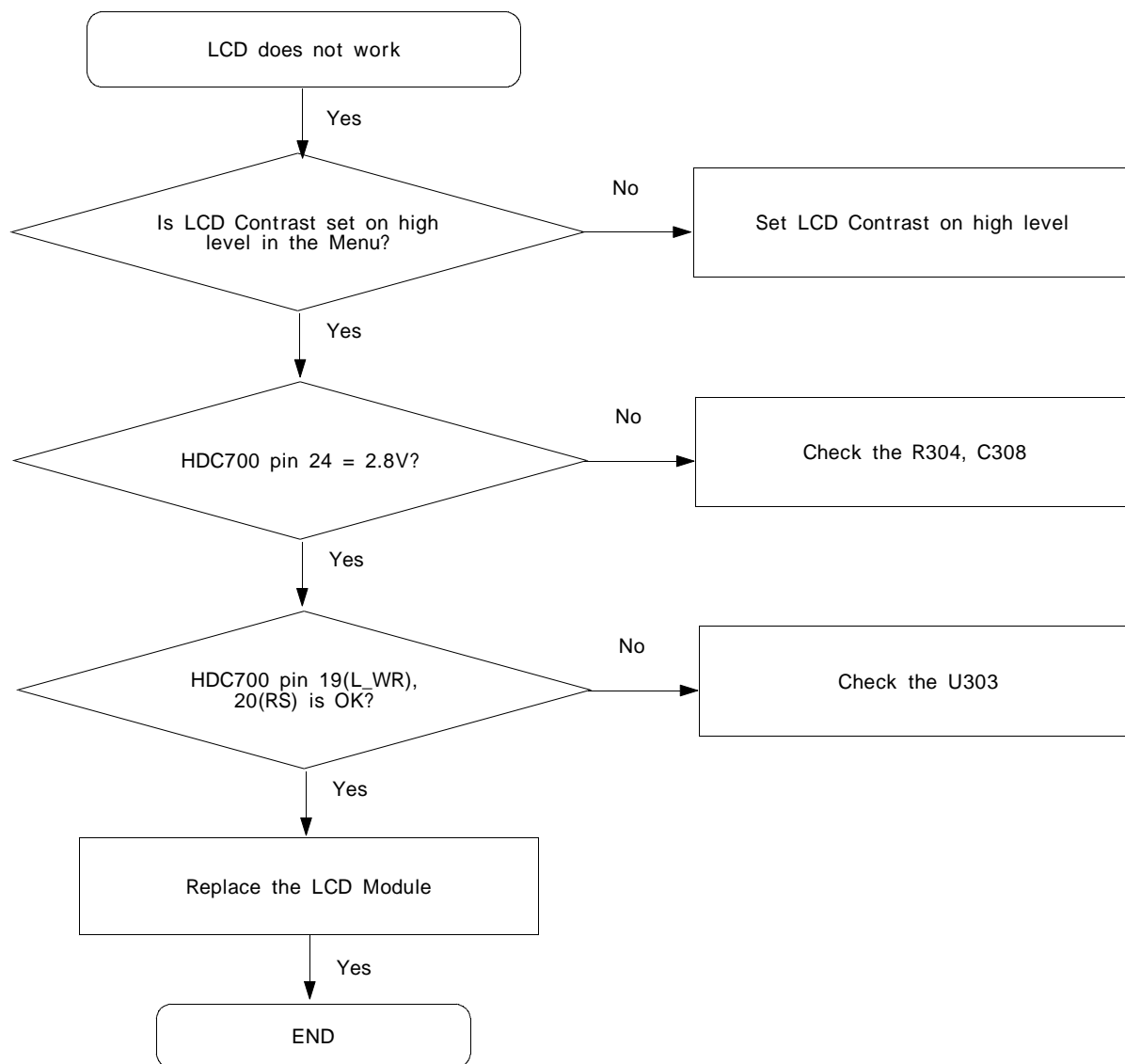
7. Key Data Input



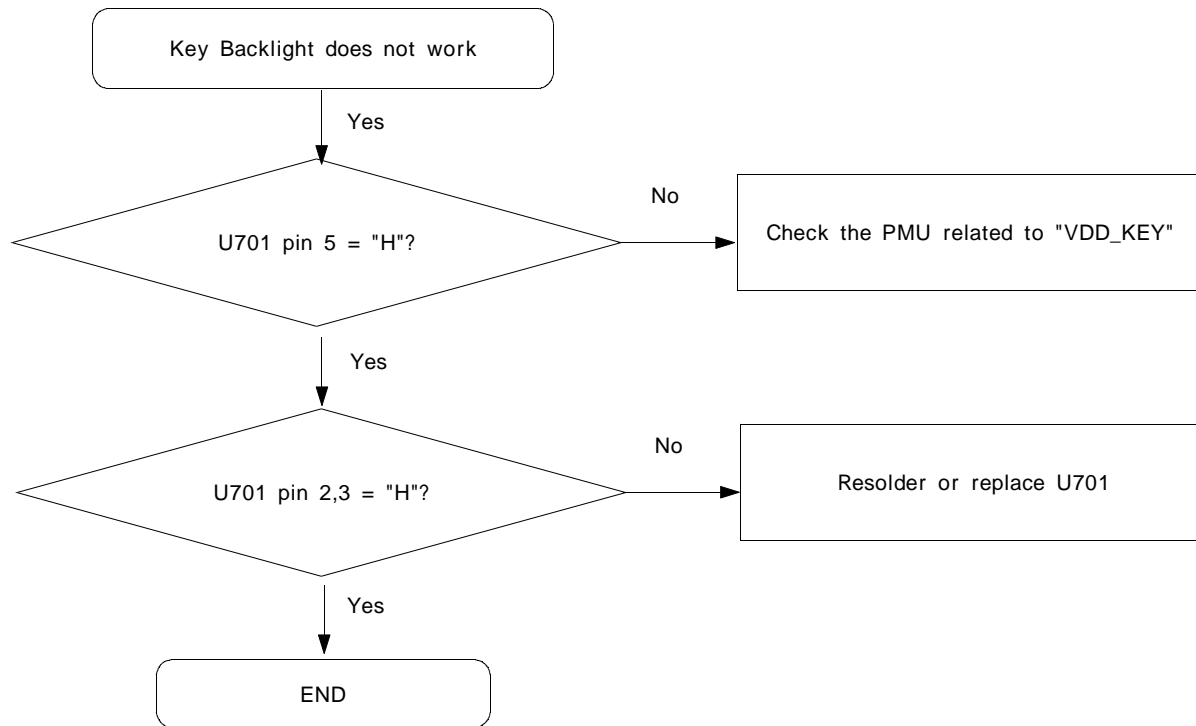
8. Receiver Part



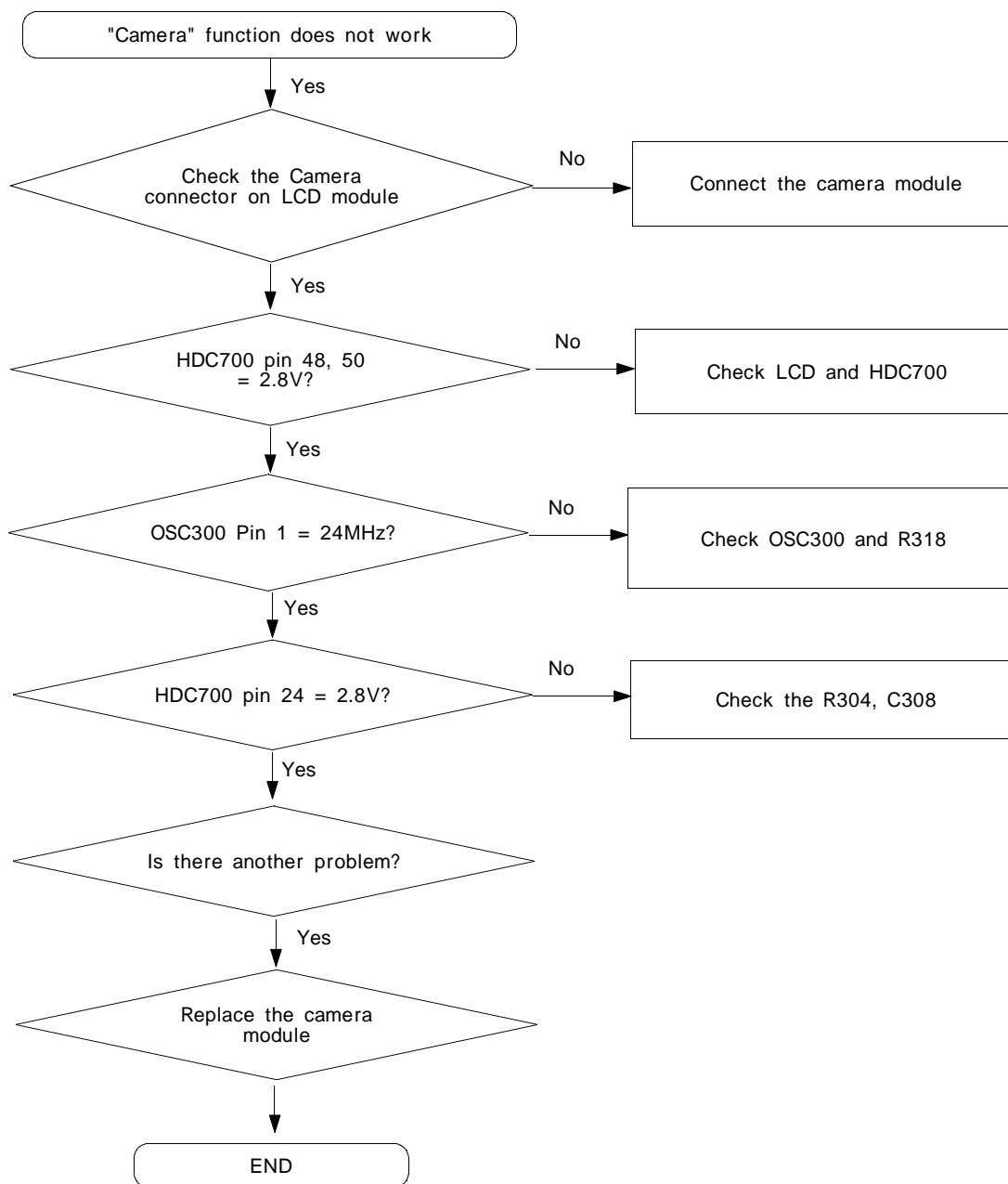
9. LCD Part



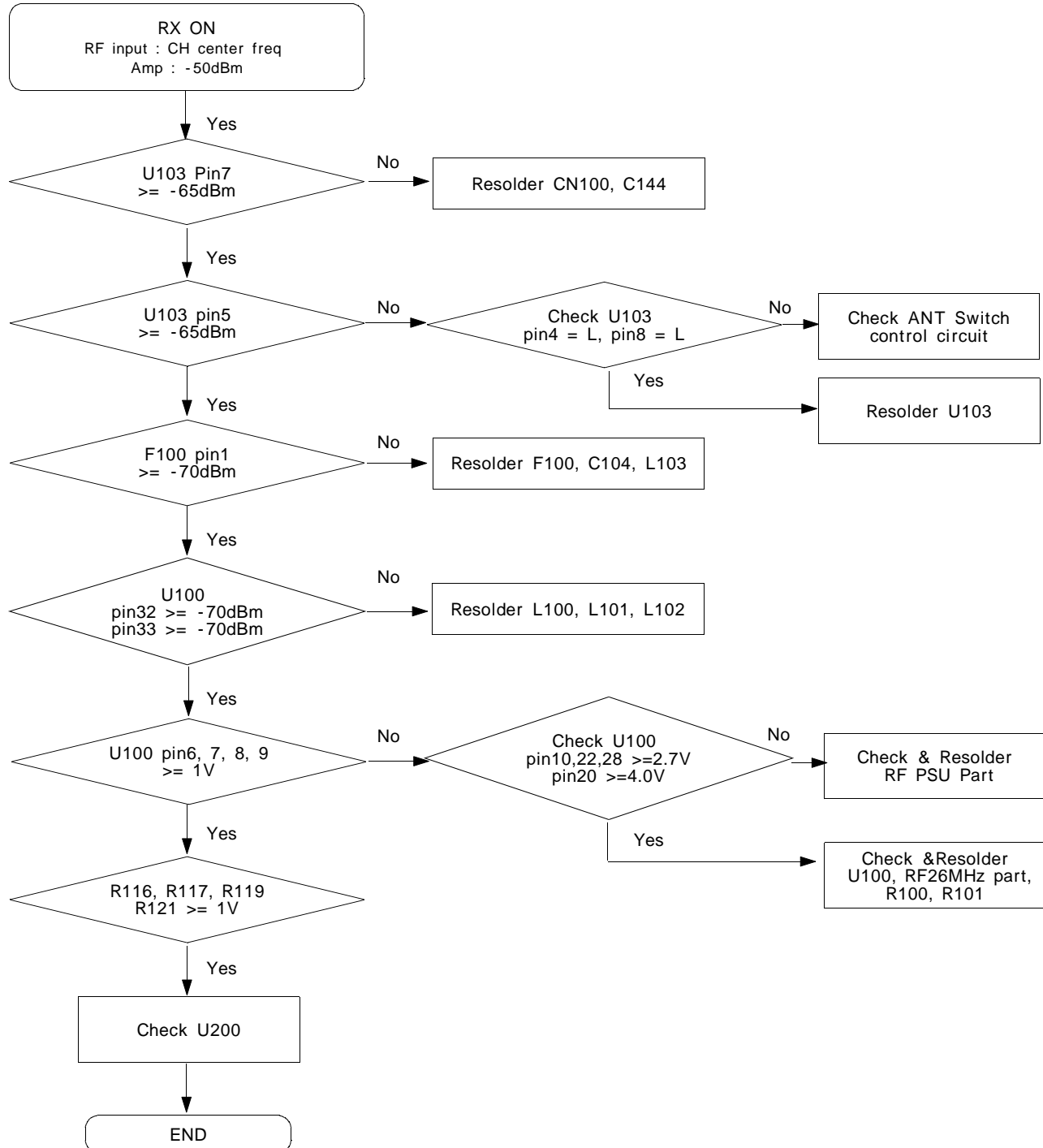
10. Key Back Light



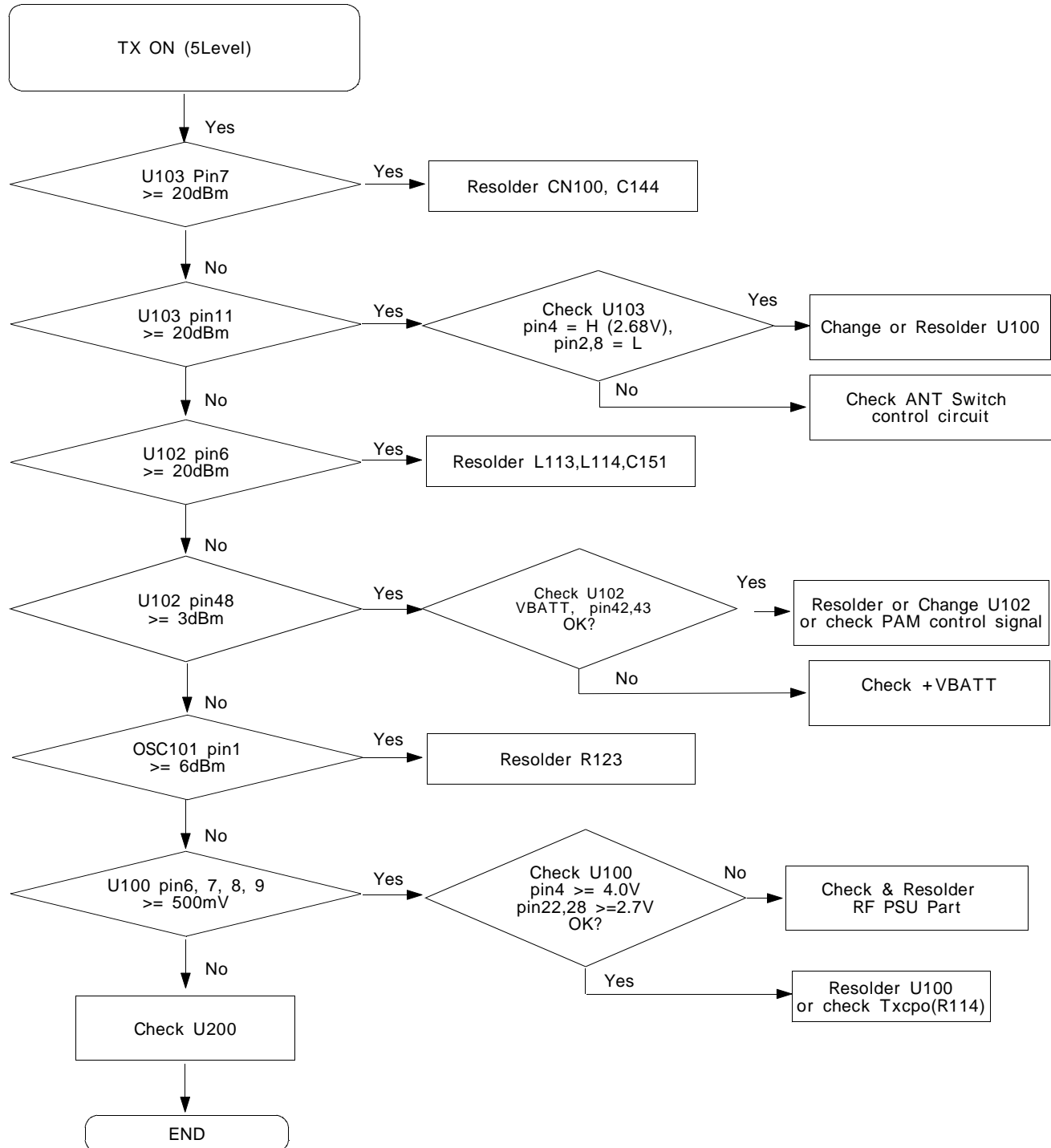
11. Camera part



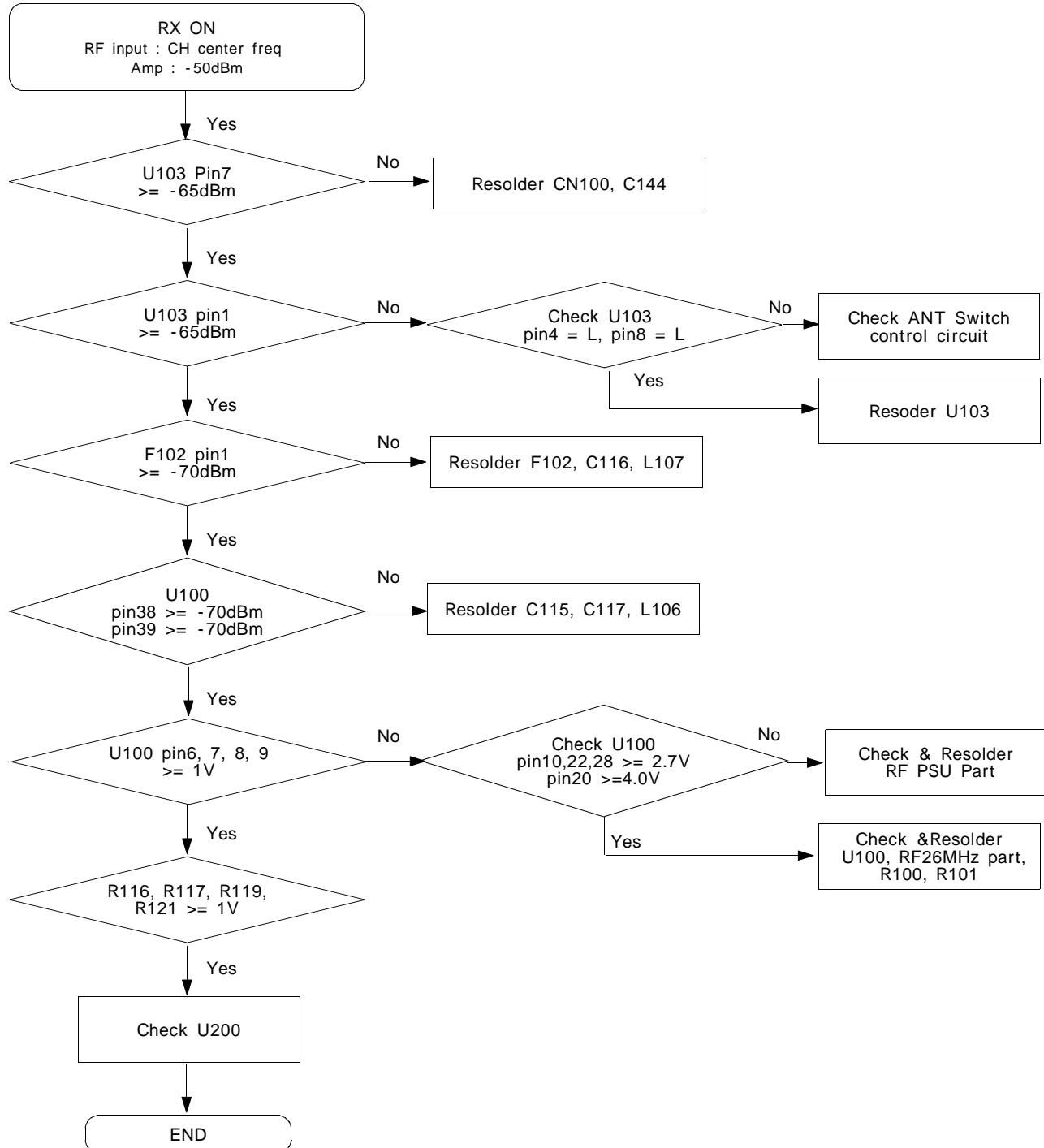
12. GSM Receiver



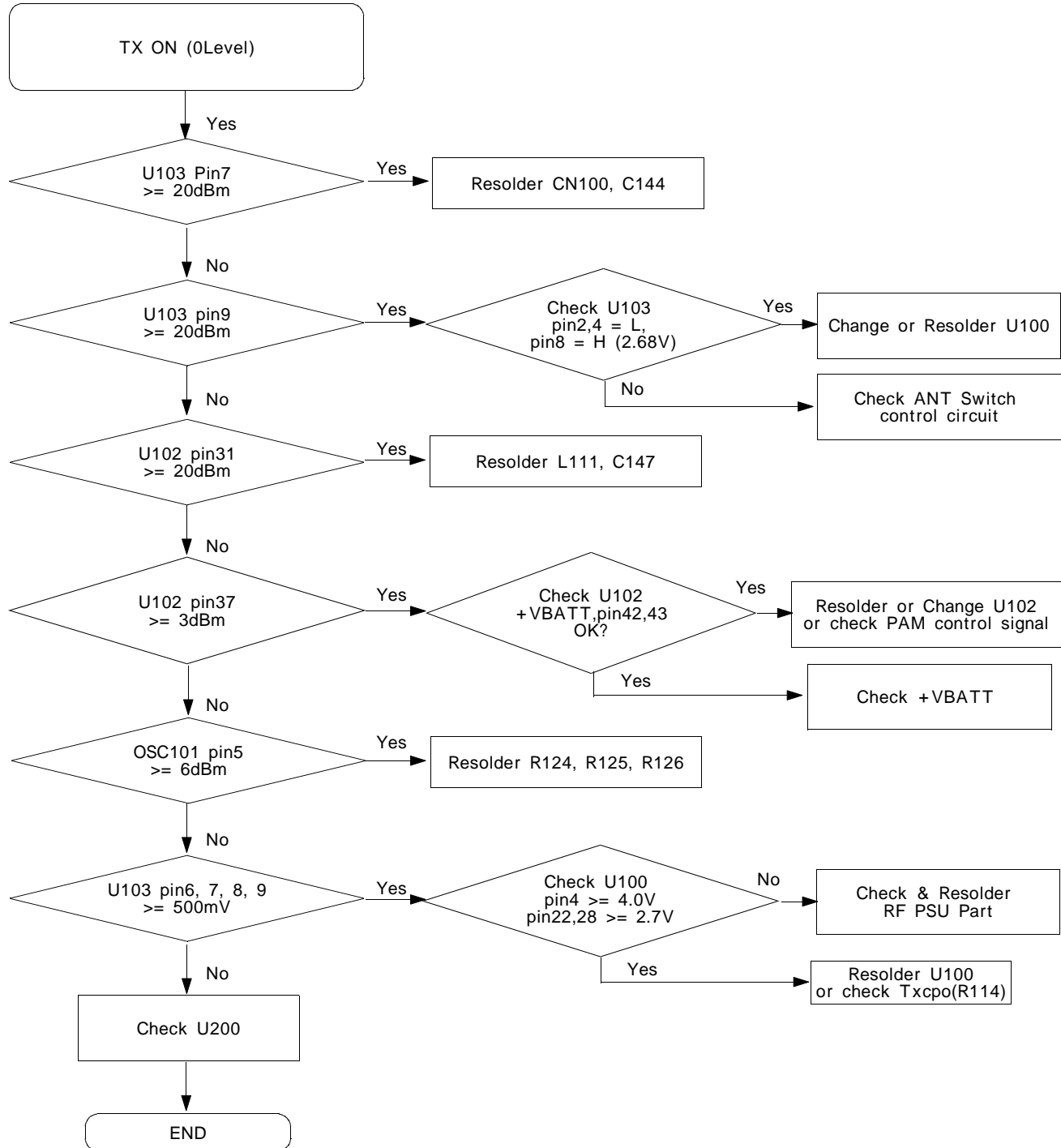
13. GSM Transmitter



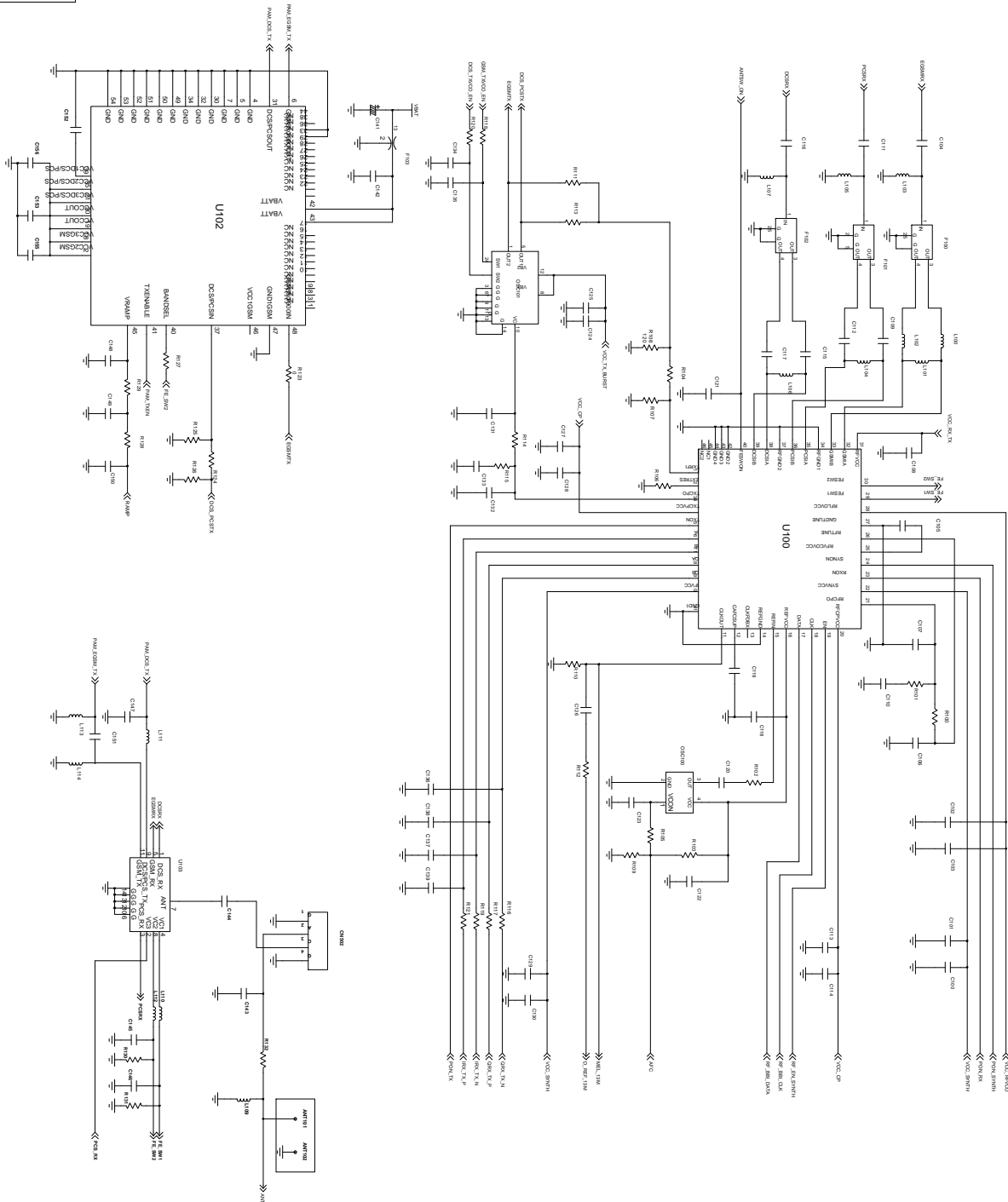
14. DCS Receiver



15. DCS Transmitter



Transmitter



ESSM_TX	1	0	0
ESSM_RX	0	0	0
DOS_TX	0	1	0
DOS_RX	0	0	0
POS_RX	0	0	1

